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A project designed (1) to determine the incidence of vocalism during silent reading in intermediate-grade children classified as either reading retardates or achievers and (2) to determine the desirability of this vocalism as an adjunct to the reading process was described. The major conclusions reached were that implicit speech is a natural adjunct of the reading process, that it is a residue of initially learned oral language patterns, and that it is often used as an additional sensory input. Implications drawn from the study were: (1) that no inhibitory measures should be taken to cause a decrement in manifestation; (2) that implicit speech may be a frame of reference for validating written language patterns as consonant with oral language; (3) that organization of an optimal reading environment conducive to maturity is a sound method for causing a decrement in implicit speech manifestation; (4) that a basal program emphasizing phonics does not result in an undue manifestation of recorded implicit speech; and (5) that mechanically presented reading material may result in greater implicit speech manifestation. A bibliography and three appendixes containing raw data, tests used for population identification, and sample myographic materials are included. (Author/MKD)

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FINAL REPORT

PROJECT NO. 5–0374
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VOCALISM IN SILENT READING

JUNE 1968

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FINAL REPORT

Cooperative Research Project No. 5-0374

Grant No. OE 4-10-056

VOCALISM IN SILENT READING

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U. S. DEPARTMENT OF
HEALTH, EDUCATION, AND WELFARE

Office of Education
Bureau of Research

FOREWORD

The conduction of the research project described and reported herein would have been impossible without the co-operation of a host of loyal and dedicated professional scholars. To list each one who gave encouragement and guidance while the study was being planned, and the subsequent execution of it, would comprise a list unduly long for publication. Be it known, therefore, that the Director of the study, takes cognizance of all who contributed to the study, and thanks them most sincerely.

Special recognition must be given to Drs. Amedo Marrazzi and Ross Hart, Director and Assistant Director of the Veterans Administration Research Laboratory in Neuropsychiatry, Leech Farms, Veterans Hospital, Pittsburgh, Pennsylvania, who rendered invaluable guidance and help in planning and conducting the pilot study. Again, acknowledgement is made to Dr. Oakley Ray, Chief, Psychological Research, Veterans Administration Hospital, Leech Farms, Pittsburgh, Pennsylvania, for his continuing encouragement and guidance during the final stages of the study.

Sincere thanks is accorded to the West Mifflin School System, the Snowden Township Schools, and the Pittsburgh Public Schools from which we secured the testees. All administrators, supervisors, and teaching staff concerned cooperated in a manner that bespeaks of their professional competence and dedication to the education of our children.

Among others who contributed much to the successful completion of the study are: Mr. Barry Kaufmann, Research Assistant for the first year, and Dr. James L. Laffey, Research Assistant during the final two years of the study, and the following Graduate Student Assistants who served with distinction during the various stages of the study: Mrs. Dorothy Ahrens, Mr. Gary Anderson, Miss Mary Agnes Good, Mr. William Davies, Miss Martha Dougherty, Mr. Charles Ehmer, Mrs. Billie Hubrig, Mr. Robert Kaiser, Mr. J. Wm. McKay, Mrs. Ruth Macmillan, Mr. Harry Miller, Mr. Joseph Nemeth and Mr. Robert Wilson. A special note of recognition to the late Dr. Robert Brittell, Associate Dean of Education, who gave constant encouragement during the pilot study.

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Donald L. Cleland
June, 1968

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SUMMARY

Many aspects of the reading process have remained a controversy over a period that encompasses public education in our democracy. One of these is the topic of vocalism, or implicit speech--does it exist, is it a natural adjunct of the reading process or should its manifestation be inhibited? These and other questions have plagued not only the teacher in the language arts, but researchers who have sought techniques to determine its incidence, and possibly its effects upon the process of silent reading.

The fact that a controversy has existed over an extended period of time is ample reason why concerted efforts should be made via sophisticated research, to clear, as it were, the issues or to bring them into sharper focus.

DAVIES STUDY

The chief investigator of this research project, after reading what other researchers had found, became interested in this aspect of the language process and subsequently directed a doctoral dissertation which sounded current attitudes and practices concerning vocalism in 1962. Consequently, Davies (11) prepared a Likert Scale Attitude Measure questionnaire of items having at least a minimal item discrimination power of 1.0 and a total reliability of .79 was standardized as the primary means by which data were collected.

An analysis of the data secured from the questionnaire strongly suggested that the three sub-populations were not representative of a homogeneous population, and furthermore that there was a significant difference between the attitudes of the Experts and Workers-in-the-field. The narrative material gleaned from the questionnaire provided provocative reading and ranged all the way from a liberal, tolerant attitude towards vocalism to a conservative one.

PILOT STUDY

As a result of the aforementioned study, the chief investigator approached Dr. Amedo S. Marrazzi, Director of the Veterans Administration Research Laboratories in Neuropsychiatry, Leech Farms Veterans Hospital, Pittsburgh, Pennsylvania, seeking advice as to appropriate equipment to use in a pilot project. He and Dr. Ross Hart, Assistant Director, gave unstintingly of their talents and time as explorations were made relative to electrode locations, choices of material and techniques of presentation to the experimentees, and various means of obtaining the necessary synchronizing signals. The results of the pilot study gave much valuable information and as a result, helped to solve operational problems, as well as the establishment of a workable protocol that was followed throughout the study.

PRESENT STUDY

The general objectives of the study reported in this volume were two-fold in nature:

Objectives

1. To determine the incidence of vocalism during silent reading of two groups of intermediate grade children, i.e., one group which were classified as reading retardates and a second group classified as reading achievers,
2. To determine if vocalism during silent reading is a desirable, natural and helpful adjunct of reading and learning, or, on the other hand, if it is an undesirable adjunct of the silent reading process.

Falling within the context of the above general objectives, are the following objectives:

1. To determine the incidence of vocalism in silent reading among a selected group of intermediate grade children,
2. To determine which of two groups of these children, the reading achievers or the reading retardates manifest a higher incidence of vocalism during silent reading,
3. To determine the relationship between the incidence of vocalism in silent reading and reading rate,
4. To determine at which rate of reading there is minimal incidence of vocalism in silent reading,
5. To determine the relationship between the incidence of vocalism during silent reading and efficiency of comprehension,
6. To determine the relationship between methods of reading instruction (Basal (vs) Basal with Supplementary Phonics - Phonetic Keys to Reading) and vocalism during silent reading,
7. To determine the relationship between vocalism in silent reading and selected language processes.

Preliminary Evaluation

Initially, preliminary evaluations of approximately 1,200 intermediate grade children were made. Of this group, 211 were selected for the study.

Of these, 95 were identified as reading retardates and 116 were identified as reading achievers.

During the three years of 1964, 1965, and 1966, the selected experimentees, in small groups and individually, were transported via commercial carriers to Leech Farms Veterans Hospital for measuring the incidence of vocalism (implicit speech) during a standardized routine of speaking, oral, and silent reading.

Modes of Presentation

After the equipment was checked, the reading material was presented to the experimentees, mechanically and non-mechanically:

1. Mechanical mode of presenting the reading material - reading material presented with a modified Junior Model Metronoscope: a mechanical device which was originally designed to develop phrase reading. The reading material, usually of a story type, is presented in sentences on a rotating roll of paper and is shown through three windows, opening sequentially from left to right. By manipulating the speed of the roll and the fluctuating slides, the rate of presenting the reading material can be controlled by the operator.

2. Non-mechanical mode of presenting reading materials - stories selected from reading texts at different levels of difficulty were given to the pupils for silent reading. These stories were reproduced on 8 1/2" x 11" paper and presented to the experimentees.

Operational Protocol

With the exception of certain preliminary activities and calibration procedures, a brief description of operational protocol was as follows:

1. Surface electrodes, to which was attached electrolytic paste, were placed on the speech musculature as follows:
   a. To the left ear lobe (the ground)
   b. Upper lip - placed midway between the midline and the corner of the mouth
   c. Corner of the mouth - left side
   d. Lower lip - placed midway between the midline and corner of the mouth.

2. Each electrode was checked with a maximum level of 15K ohms of resistance.

3. A thirty second calibration period preceded and followed each experimental testing activity.

4. Each subject read silently from easy reading material. Five comprehension questions were asked.

5. Each subject read orally from easy reading material. Five comprehension questions were asked.

6. Each subject read silently from difficult material. Five comprehension questions were asked.

7. Each read orally from difficult material. Five comprehension questions were asked.

Note: In steps four, five, six, and seven, the reading material was presented mechanically, via a modified model of the Junior Metronoscope. In steps eight and nine, the reading material was presented non-mechanically.

8. Each subject read silently from easy material. Five comprehension questions were asked.

9. Each subject read silently from difficult material. Five comprehension questions were asked.

10. After the final thirty-second calibration period, the electrodes were disconnected, and the experimentee was given a section of the myographic print-out as a souvenir.

Findings

The findings in this study, as reported in this summary will be related to the seven specific objectives listed heretofore.

1. To determine the incidence of recorded implicit speech among a selected group of intermediate grade children.

It was determined that more implicit speech was manifested during a reading activity than during a non-reading activity. This was noted for both easy and difficult material. There was more recorded implicit speech during the silent reading of operationally defined easy material than during the reading of operationally defined difficult material. Also there was more recorded implicit speech manifested while reading at an operationally slow rate than during an operationally defined fast rate. The differences were significant at the .01 level of confidence.

2. To determine which of two groups of children, the reading achievers or the reading retardates, manifest a higher incidence of recorded implicit speech.

When comparisons were made between the two groups of children, the operationally defined achievers and retardates, the latter group manifested more recorded implicit speech under all experimental conditions. When the material was presented mechanically, both achievers and retardates manifested more recorded implicit speech during the reading of operationally defined easy material. Contrary to this, when the reading material was presented non-mechanically, both achievers and retardates manifested more recorded implicit speech when reading difficult material.

3. To determine the relationship between the incidence of recorded implicit speech and reading rate while reading silently.

The rate at which the reading material was presented varied from approximately 88 words/minute to approximately 200 words/minute. At each thirty-second interval the rate was increased. It was noted, that as the rate was periodically increased there was a decrement in recorded implicit speech. This observation was noted as both achievers and retardates read operationally defined easy and difficult material.

4. To determine at which rate of reading there is minimal incidence of recorded implicit speech.

As may be noted in the above, there was an inverse relationship between recorded implicit speech and the mechanical rate of presentation of silent reading material. A sharp decrement in recorded implicit speech was noted as the rate of presentation was increased from approximately 88 words/minute to approximately 107 words/minute. From 107 words/minute to 182 words/minute approximately there was slight decrement in recorded implicit speech; however, from this latter rate to the limit of the machine, approximately 200 words/minute, there was little decrement in recorded implicit speech. It can be assumed, however, with a fair degree of confidence that among intermediate grade children, there will be little decrement in recorded implicit speech when they read silently in excess of approximately 180 words/minute.

5. To determine the relationship between the incidence of recorded implicit speech during silent reading and efficiency of comprehension.

It is interesting to note that the mechanical presentation of reading material influenced reading behavior. More implicit speech was manifested, and better comprehension scores were obtained by the retardates when the reading material was mechanically presented. When the reading material was presented non-mechanically, with both easy and difficult material, those taught by the Basal Approach manifested more recorded implicit speech, but those taught by basal augmented by a phonics program obtained higher scores on the comprehension test.

6. To determine the relationship between methods of reading instruction (Basal (vs) Basal with Supplementary Phonics-Phonetic Keys to Reading) and recorded implicit speech during silent reading.

To explore the relationship between recorded implicit speech and methods of beginning reading instruction, comparisons were made between two groups of children; one taught with the Basal Method and the second taught with a Basal Method supplemented with phonics. When both easy and difficult material were presented at both slow and fast rate mechanically, the children taught by the basal approach manifested more recorded implicit speech than did those taught by a basal approach augmented by a phonics program. When the material was presented non-mechanically, again the children manifested more recorded implicit speech, but the difference was not significant at the .05 level of confidence.

7. To determine the relationship between recorded implicit speech and selected language processes.

Are these relationships negative or positive? Does the mode of presentation influence reading behavior? While it is impossible to draw general conclusions concerning the relationship between recorded implicit speech and selected language processes, abstracting relevant data from the study reveals some interesting patterns.

The manner in which the reading material was presented determined whether or not the correlation between mental age, as determined by the Binet, and recorded implicit speech was positive or negative. This fact was true also as pertains to the correlation between words spelled correctly on the Spache Spelling Test and recorded implicit speech. The mode of presentation of the silent reading material had little effect upon the correlation that existed between recorded implicit speech and scores obtained on the following tests: STEP Listening Test, Wepman Auditory Discrimination Reading Test, Arithmetic Computation Part of the American School Achievement Test, McCullough Word Analysis Test, and errors made by the experimentees on the Gilmore Oral Reading Test.

In most instances, negative correlations were found to exist between recorded implicit speech and the language processes as measured by the tests listed above. Exceptions to the above statement were noted with scores on the Spache Spelling Test and Mental Age as determined by the Stanford Binet Intelligence Scale.

Conclusions

One very significant conclusion that was drawn from patterns of scores is that implicit speech, as defined and measured in this study, is a natural adjunct of the reading process, that it is possibly a residue of initially learned oral language patterns, and furthermore that at appropriate times all of us use it as an additional sensory input into cortical functioning or that it is a secondary reinforcing agent.

At least five implications can be drawn from the data collected and observed behaviors of the experimentees, to wit:

1. No inhibitory measures should be taken to cause a decrement in its manifestation, and furthermore that a natural decrement will occur as students acquire maturity in reading skills,
2. That implicit speech may be a frame of reference when we wish to validate written language patterns as being consonant with our own natural rhythmic patterns of oral language,
3. That a psychologically and pedagogically sound method to cause a decrement in the manifestation of implicit speech is to organize the optimal reading environment, and to judiciously manipulate it so that students will acquire maturity in reading and language skills,
4. That augmenting a basal program with emphasis upon phonics, does not, *per se*, result in an undue manifestation of recorded implicit speech,
5. There is some evidence that when reading material is mechanically presented to readers, more recorded implicit speech is manifested.

I. Introduction

A. Background of the Problem

Many aspects of the art of teaching have remained a controversy over a period that encompasses public education in our democracy. Among these is the topic of vocalism in silent reading. The fact that it has many synonyms, certainly has not cleared the educational air; but on the contrary has, perhaps, added to the confusion. A search of the literature would reveal such synonyms as implicit speech, inner speech, covert language, inner vocalization, subvocalization, silent speech, vocalism, etc.

The fact that a controversy exists, that some say that it is part and parcel of the reading process, and that others say that techniques should be employed to inhibit its existence, is ample reason that concerted attempts should be made to resolve the problem.

In order to form a backdrop against which a better evaluation of the research conducted jointly by the School of Education, University of Pittsburgh, and Leech Farm Veterans Hospital, and sponsored by the United States Office of Education (contract No. OE4-10-056), a review of related research would seem appropos at this time.

It is interesting to note that Gerald A. Yoakam (30), writing in 1928, drew some sage conclusions concerning the nature of vocalism:

1. The process of vocalization goes on even in silent reading in the case of almost all, if not all readers.
2. The amount of vocalization varies with the reader.
3. Lip movements accompany the silent reading of young children and also of inefficient adult readers.
4. It is thought by some that vocalization of a perceptible sort is unnecessary and could be avoided by the right kind of training.

Cole (8), writing some ten years later, listed five stages of vocalization in silent reading:

1. Saying or whispering every word.
2. Faint whispering of many words.
3. Pronounced lip movements but no sound.

4. No lip movements or sound, but palpable movements of tongue.

5. No lip movements, sound, or palpable movements of tongue, but palpable movement of the throat.

The above stages fall within the context of palpable or discernible movements of the musculature of the speech organs. As suggested by Edfelt (12), a sixth stage could be added.

6. No discernible or palpable movements except through electromygraphy.

Early opinions concerning the role vocalism plays in the reading process were based largely on introspection. Two diametrically opposed views were represented by S. S. Stricker (25) and M. Paulhan (23), who gave their opinions during the latter part of the nineteenth century. Stricker and his subjects asserted that they could not think of letters or words without experiencing allied speech motor phenomena. Contrarily, Paulhan claimed that he could think of anything without experiencing the corresponding speech-motor phenomena. Bain (3), a physiological psychologist considered thinking to be more or less restrained vocalization or acting. Egger (13) and Ballet (4), French psychologists investigating aphasia, announced: "To read as a matter of fact is to translate the written word into words to be spoken." Experimenting with mindreading, again during the latter part of the nineteenth century, Hansen and Lehmann (15) found that a person thinking intently of a number will often unconsciously whisper the number and that this whisper could frequently be heard by the experimenter without the subjects' or the audience being aware it had been whispered.

In 1961, a century and a half later, Albert J. Harris (16) eminent specialist in the area of reading, made the judgements:

> It is not advisable to discourage lip movements in children whose reading is below third grade level. At the third grade level, children can be asked to try to read the way grown-ups do, without any movement of the lips. In most cases, reminding the child that he is not supposed to move his lips is all that is necessary. When the habit persists in spite of efforts to overcome it, one can prevent lip movements by leaving the child hold the tip of a pencil between his teeth.

Believing that inner speech may be a detriment to efficient silent reading, O'Brien (22), McDade (20), and Buswell (6) suggested a non-oral method of beginning reading instruction. The results were somewhat inconclusive and discouraging. The non-oral method did not eliminate silent speech to any greater degree than did other methods.

Finally, Anderson and Dearborn (2), endorsed by Tinker (27) made a rather revolutionary recommendation that vocalism is a desirable, developmental, learning reinforcement activity, and that its elimination should not be prematurely precipitated. Of interest at this juncture is Hollingworth's (17) theory of cue-reduction or reintegration in which a portion of a complex stimulus would elicit the same response as the original complex stimulus would evoke.

Early attempts at measuring vocalism were crude but rather ingenious when consideration is given to the methods and equipment available. Curtis (10) placed a tambour on the larynx and recorded its movements with the subjects reading Hiawatha. Silent reading produced more movements than any other mental activity. Only actual whispering produced more. It is interesting to note that four of the experimental cases manifested no movement at all. Parallel to Curtis' work were the results obtained by Courten (9). He recorded the movements of the tongue during the performance of the same activities as Curtis' experimentees. Courten worked with a rubber bulb on the tongue, the bulb being connected to a recording tambour.

Wyczoikowska (29) explored the connection between tongue movements and movements of the right thumb of a group of students. In the same report she outlined an experiment in which only tongue movements were measured. The subjects were instructed to solve certain mental problems or simply to think (not recite) certain phrases over and over again. The results were the basis for her conclusions that, possibly, every act of thought was accompanied by movements of the tongue.

Another attempt to solve the problem experimentally was made by Reed (24). He obtained recordings from the tongue by means of a specially constructed drum which was placed in the mouth. It was constructed so as to measure slight changes in air pressure in the oral cavity. He obtained five curves, namely: breathing curve, silent reading curve, writing curve, whispering curve, and an oral reading curve. Reed also made recordings during mental counting, and the mental employment of the fundamental processes in arithmetic. On the basis of the results obtained, Reed concluded that inner speech is an individual peculiarity of certain persons.

Clark (7) in 1922, after consolidating the knowledge of her experimental predecessors, completed an experiment in which the tongue and laryngeal muscle movements of the subjects were recorded. Unfortunately, the findings of this experiment were vague and inconclusive.

In 1925 Thorson (26) evaluated and criticized all the previous research on silent speech and drew from the data obtained by predecessors the following conclusions:

1. Rubber bulb apparatus was unsatisfactory since it reacts to all other kinds of changes.

2. All tongue movements have been categorized as indicators of internal speech.

3. The nature of the apparatus encourages artifact movements.

4. Therefore tongue movements are not always present with internal speech or verbal thought.

Following this critical review of past research, she completed an experiment and concluded that tongue movements did not always accompany internal speech or verbal thought. When vocalism in silent reading does occur, Thorson maintained further, it corresponded very poorly with those movements which accompany similar activity in overt speech.

As a result of Thorson's review of research and her subsequent investigations, experimentors and reading experts generally became aware of the inadequate techniques used in this type of research. Consequently, little progress was made during the next twenty-five years. It wasn't until 1950 that Edfelt (12), after experimenting further with rubber bulbs attached to an Elmquist Mingograph (an electronically activated direct writing instrument), reaffirmed Thorson's earlier conclusions by stating that "new techniques are needed for any further progress."

The work of Jacobson (18) gave impetus to the belief that Electromyography, the literal meaning of which is electric writing of the muscles, would be an efficient way of measuring the implicit movements of the muscles of the speech mechanism. Electromyography is premised on the fact that a muscle has a certain electric charge, and that this electric potential would increase as muscles contract. This electric action potential (EAP) can be measured by either surface electrodes appropriately placed on the skin or needle electrodes which are placed inside the muscle. General investigators Adrian and Bronk (1) have shown that these electric potentials increase in number as well as frequency when muscular contraction increases.

Probably, one of the first experiments in which muscular electric action potential (MEAP) was measured by needle electrodes was completed by Jacobson (18) during the early part of the nineteenth century. Five platinum iridium wires were inserted into the muscles of the tongue or lower lip. The experimentees in these experiments were instructed to imagine counting from one upward, to imagine telling something to a friend or to think of abstract subjects such as democracy, eternity, electrical resistance, Ohm's Law, or the meaning of words such as incongruous or everlasting. The experimentees were trained in differential relaxation or the ability to consciously relax individual muscles or groups of muscles.

The recordings of the muscles of the tongue or lower lip of these testees as measured by a galvanometer indicated very nearly no activity when the relaxation was called for, but as soon as a signal was given to perform the tasks listed previously, activity was noted.

Also of interest in this connection is the work of Max (19). Surface electrode recordings were obtained from muscles of the arms of 18 deaf mutes as "the arms and fingers of this group of individuals are the foci of their oral, written, and gestural speech." Comparisons were made with a group of 16 persons with normal speech abilities. The experimentees were instructed to perform tasks similar to those of Jacobson's study above. On 31 per cent of the control group, muscular activity was noted while in the experimental group, muscular activity was noted in 86 per cent of the cases.

Another study, which is of value to the topic under discussion, was done by Faaborg-Anderson (14) on the functioning of the intrinsic laryngeal muscles in humans. The aim of this study was to determine the degree of activity of these muscles during the process of speech, both in the case of healthy persons and in the case of patients with paresis of the vocal cords. Silent speech was accompanied by an increase in electrical activity and muscle electrical action potential (MEAP) of the laryngeal muscles of both groups.

Edfelt (12) in his book, Silent Speech and Silent Reading, reveals the only comprehensive, adequately instrumented and controlled study that had been done prior to 1960. In this study Edfelt describes his method of recording implicit speech by a technique called Electromyography which was defined earlier. His responsibilities with the reception of new students at the University of Stockholm resulted in a series of lectures on the possibilities for bettering poor reading ability. An invitation was given to a program for those who wished further information and, who possibly needed advice concerning reading improvement. Of the 600 new students who attended the lectures, one hundred sixty indicated an interest in the program as outlined, and of these, eighty-four were finally selected for the experiment. An evaluation of the students who participated included the administration of an intelligence test, and the assessment of reading ability by a test in reading speed, a test in reading comprehension and a vocabulary test. Of special interest, however, was that reading comprehension was assessed by open-end questions, instead of the more conventional multiple-choice items. Finally, three groups of readers were selected, good, medium, and poor. Medium readers were defined as those whose scores fell within a plus or minus .5 above and below the mean. Good and poor readers were defined as those who scored above +.5 and below -.5 of the mean, respectively. The students were tested in a Faraday enclosure, reading easy then hard, and clear then blurred material.

Davis (11) sounded current attitudes and practices concerning vocalism in 1962. A likert Scale Attitude Measure questionnaire of items having at least a minimal item discrimination power of 1.0, and a total reliability of .79 was standardized as the primary means by which data was collected.

Three sample sub-populations were designed for interrogation:

1. Experts - (N = 100) nationally recognized authorities in reading
2. Directors of Reading Laboratories - (N = 141)
3. Workers-in-the-field - (N = 500)

Replies from a random sample of the three sub-samples were subjected to quantitative statistical and qualitative narrative interpretation. Three hypotheses were stated, namely:

1. There would exist between the three sub-populations significant differences of attitude and opinion concerning the origin, nature and function of silent speech.
2. That examination would demonstrate clinical practice falling behind the advance made in experimental research.
3. That developmental application in the field would present a marked ignorance of, and a lack of concern for, the information that has been reported in this area.

An analysis of the data secured from the Likert Scale questionnaire strongly suggests that the three categories, Experts, Directors of Reading Laboratories, and Workers-in-the-field are not representative of a homogeneous population. For the three groups, t ratios indicated that there is a significant difference between the attitudes of the Experts and the Workers-in-the-field. Findings for the Experts vs. the Directors, while not significantly different, serve to highlight the closer relationship that exists between the Directors of Reading Laboratories and the Workers-in-the-field. The narrative material gleaned from the questionnaire provides some interesting and provocative reading. Comments ranged all the way from a liberal, tolerant attitude toward vocalism to a conservative, intolerant one. The complete text of these comments may be found in the appendix of the dissertation.

A recent study of significance was designed and directed by F. J. McGuigan (21). In this study, measures were taken of lip and chin muscle action potential (electronically), mean respirations per minute, and subvocalization (defined as any word or portion of a word that, when amplified, could be heard) of three separate experimental groups. Thirty-six children, ages 6-11, who were attending a local daily vacation Bible school comprised the first group; Experimental Group II involved sixty children from a public elementary school; and twenty-four female college students served as subjects for Experimental Group III.

All subjects of Experiments I and II were administered the California Reading Test, Form W, and the Kuhlman-Anderson Intelligence Test, sixth edition. The total score on the California test was used to obtain an estimate of reading proficiency, and the I.Q. was secured through the administration of the Kuhlman-Anderson. In Experiment II all students in a first-, second-, third-, fourth-, and a fifth-grade class were classified into second through seventh grade reading levels. Students at each reading level were then further classified into five I.Q. levels based on the Standard Deviation of the Kuhlman-Anderson test. The subjects were then randomly selected from these I.Q. classifications in the proportion of 1, 2, 4, 2, 1 this being an effort to obtain a representative sample of the national population. In Experiment III, twelve students were selected from an advanced French Class and twelve from an elementary college French Class.

The findings, while not necessarily related to reading proficiency nor the lack of it, indicated that the mean amplitude of chin and lip movements during reading was significantly different from the prereading (relaxing period) in all three experimental groups, and significantly different from post-reading (relaxing period) in Experimental Groups II and III. For groups II and III, the mean number of respirations per minute was computed for the prereading, reading, and post-reading. There was an increase, significant at the .01 level, of mean number of respirations during the reading period over the prereading and post-reading period. The third response measure, number of audible subvocalizations, resulted in a mean of 1.53 for those in Experimental Group I, of .43 for subjects in Experimental Group II, and none were detected in Group III.

A study of the tables provided some interesting speculations and inferences. It appeared that those who engaged in considerable subvocalization during silent reading exhibited more lip activity and a slower breathing rate. The article in which the study is reported hazards an explanation - one might consider that while the breathing mechanism is intimately involved in speech, increases in its activity may also be otherwise produced. Breathing rate, for instance, may increase as an organism becomes more alert and "pays attention" to any stimulus.

The preceding review forms a basis for the study reported in this volume. A careful study of the research reported yields the following judgements:

1. In none of the studies reported above was there an attempt to relate incidence of vocalism in silent reading with ability to comprehend the material read.

2. In none of the research reported above was the incidence of vocalism related to both reading achievers and reading retardates selected from intermediate grade children.

3. In none of the research reported above was incidence of vocalism related to certain behavioral patterns in reading, such as word attack skills, oral reading skills, spelling skills, auditory discrimination, etc.

4. In none of the research reported above was the incidence of vocalism related to two modes of presentation of the reading material, namely: mechanical and non-mechanical.

5. In none of the research reported above was the incidence of vocalism related to intermediate grade children who had been taught by two different approaches to reading instruction during their primary grades, such as the Basal Approach and the Basal Approach augmented by the Phonetic Keys to Reading Program.

6. In none of the studies reported above was the incidence of vocalism related to varying and predetermined rates of reading.

B. Study Potential

No aspect of the teaching of reading has remained a controversy as has the role vocalism plays in the reading process. According to the Davies (11) study, attitudes toward the role vocalism plays during the silent reading process range all the way from a liberal, tolerant attitude to a conservative, intolerant one. Three general conclusions could be drawn from the questionnaires completed and returned by the participants:

1. While there are differences in attitude of the three sub-populations (Experts, Directors of Reading Laboratories, Workers-in-the-field), the greatest difference, and significant at the .02 level, existed between the Experts and the Workers-in-the-field.

2. There exists a definite trend to consider vocalism in silent reading a natural developmental reinforcement mechanism.

3. More controlled research is needed in this area.

While we have reasons to believe that vocalism during silent reading may be reduced to a minimal degree as children acquire maturity in reading, we have little research evidence to substantiate such a conclusion. Longitudinal studies are sorely needed in this facet of the reading process.

The keen observer of primary grade children can verify the fact that children sub-vocalize in varying degrees while reading silently. Overt lip movements or audible whisperings of children while reading silently attest to this conclusion. With intermediate grade children these overt behaviors are less marked, and as we watch junior or senior high school students read silently, there appears to be even less manifestation of this type of behavior. Yet a question can be asked at this point of our discussion: "Does the absence of this type of overt behavior indicate no vocalism?" Another question, naturally, comes to mind: "Are there implicit muscular movements while children read silently that can be measured only by electromyography?" Only well controlled research can give the answers.

Still another question plagues us. "Is the behavior - vocalism - a natural and helpful adjunct of the reading process, or does it have a tendency to inhibit the acquisition of meaning?" Many opinions have been given in this respect. As indicated in the Davies study, the attitudes vary from tolerant to intolerant. There are those who claim it (vocalism) is a natural adjunct to the process of acquiring meaning, and, on the other hand, there are those who claim it inhibits natural silent reading and the concomitant acquisition of meaning. Thus, again, a controversy exists. Research is needed to supply the answer.

C. Definition of Terms

Listed below is an operational definition of terms as found in this report.

1. Vocalism - refers to those implicit muscular movements of the speech musculature, specifically those muscles located near the mid-point between the corner of the mouth and the mid-line of the upper lip; and the muscles located near the mid-point between the corner of the mouth and the mid-line of the lower lip.

2. Electromyography - the muscle action potential (electrical) transformed into polygraphic writing or records.

3. Polygraph - an electrical instrument capable of transforming electric energy into ink writings.

4. Basal Approach - a systematized method of teaching reading skills - these skills outlined and taught in a sequential manner as stated in the accompanying teacher's manual.

5. Phonetic Keys to Reading - an intensified phonics program that is used as a supplement to a basal program.

6. Reading Expectancy Level (REL) - a derived score which represents the level at which a child should be able to read. The prognostic score used in this study is based on the following regression equation:

   $$X = .98A + .85B + .50C - 56.07$$

   X = Reading Expectancy Level
   A = Raw Score of STEP
   B = Raw Score obtained from the Administration of the American School Achievement Test - Arithmetic Computation
   C = Intelligence Quotient as determined by the Primary Mental Abilities Test, Grades 4-6

7. Reading Achievers (RA) - are defined as those pupils whose actual composite reading score was +.6 grade level or more above their derived reading expectancy level.

8. Reading Retardates (RR) - are defined as those pupils whose actual composite reading score was -.6 grade level or more below their derived reading expectancy level.

9. Actual Reading Level (ARL) - the pupils average grade level score on Forms I and II of the Gates Reading Survey Tests.

10. Mechanical Mode of Presenting Material - reading material presented with a modified Junior Model Metronoscope; a mechanical device which was originally designed to develop phrase reading. It is approximately twelve inches wide, six inches long, and five inches high. On the front there is a small window about seven inches long and one inch high. Reading material, usually of a story type, is presented in sentences on a rotating roll of paper and is shown through the window to the reader. Phrases are exposed, sequentially from left to right, by three small fluctuating slides in the window. As the last slide of one line of material is shown the roll rotates to the next line. By manipulating the speed of the roll and the fluctuating slides, the operator influences the reader's eye movements, length of phrase (dependent upon type, size, and length of time), and rate of reading.

11. Non-Mechanical Mode or Textbook Form of Presenting Materials - stories selected from reading texts at different levels of difficulty were given to the pupils for silent reading. These stories were a series of graded stories organized as an informal reading inventory as suggested by Betts (5).

12. Non-Reading - subjects' muscle action potential (MAP) or lip movement behavior was recorded by the electroencephalograph while the subjects sat quietly and were not reading.

13. Electroencephalograph - an electronic instrument used to detect, amplify, and record alpha, and other waves of the brain. (The instrument used in this study was a Model 111-D, manufactured by the Grass Instrument Company).

14. Integrator (5U-1) - an electric capacitor (condenser) in which the amplified muscle action potentials (MAP) were stored. When the peak of the capacitor was reached, it discharged, causing a deflection of the ink writing pen.

15. Easy Reading Material - reading material one and one-half grades or more below the experimentees actual reading level (see No. 9).

16. Difficult Reading Material - reading material one and one-half grades above the experimentees actual reading level (see No. 9).

17. Slow Rate - mean rate of first four increments, first-fourth, inclusive (see Table XIX).

18. Fast Rate - mean rate of last four increments, fifth-eighth, inclusive (see Table XIX).

II. The Objectives of the Study

A. General Objectives

The general objectives of the study are as follows:

1. To determine the incidence of vocalism during the silent reading of two groups of intermediate grade children, i.e., one group which may be classified as reading achievers (reading at least +.6 grade above reading expectancy level), and a second group classified as reading retardates (reading at least -.6 grade below reading expectancy level).

2. To determine if vocalism during silent reading is a desirable, natural, and helpful adjunct of reading and learning, or, on the other hand, if it is an undesirable adjunct of the silent reading process.

B. Specific Objectives

Related to the general objectives of the study are the following specific objectives:

1. To determine the incidence of vocalism in silent reading among a selected group of intermediate grade children.

2. To determine which of two groups of these children, the reading achievers or the reading retardates manifest a higher incidence of vocalism during silent reading.

3. To determine the relationship between the incidence of vocalism in silent reading and reading rate.

4. To determine at which rate of reading there is the minimal incidence of vocalism in silent reading.

5. To determine the relationship between incidence of vocalism during silent reading and efficiency of comprehension.

6. To determine the relationship between methods of reading instruction (Basal Approach vs. Basal with Supplementary Phonics - Phonetic Keys to Reading) and vocalism during silent reading.

7. To determine the relationship between vocalism in silent reading and selected language processes.

III. Procedures and Techniques

The procedures and their sequence for this study were as follows:

A. Selecting Experimentees

1. Pilot Study

During the school years of 1961-62 and 1962-63 a pilot study was completed at Leech Farm Veterans Hospital which is located near Pittsburgh, Pennsylvania. Many experts in their chosen area were involved with the initial project. Dr. Amedeo S. Marrazzi, Director of the Veterans Administration Research Laboratories in Neuropsychiatry, Leech Farm Veterans Hospital and Dr. Ross Hart, Assistant Director, gave unstintingly of their talents and time as explorations of various electrode locations, various choices of material and techniques of presentation to the subject, and various means of obtaining the necessary synchronizing signals. The results of the pilot study gave much valuable information and as a result, helped to solve many operational problems. Also, the pilot study enabled the establishment of a workable protocol that was followed throughout the study.

2. Preliminary Evaluation

During the months of September, October, and November of the years 1963, 1964, and 1965, preliminary evaluations of approximately 1200 intermediate grade children were made. Thus about four hundred children were tested during the fall months of the three years mentioned previously. The following tests were administered as preliminary measures:

a. Primary Mental Abilities Test for Grades 4-6.
b. The Sequential Test of Educational Progress for Listening, Form 4A.
c. The American School Achievement Test, Intermediate Battery, Form F, Arithmetic Computation Section only.
d. The Gates Reading Survey Test, Forms I and II.

3. Population Selection

During December of the years mentioned, and extending into January of the ensuing year, subjects were selected for the experiment on the basis of a Reading Expectancy Level (REL) formula derived in a study by Toussaint (28). The specific formula, as determined by a multiple regression equation, with the weighted values for each testing instrument is repeated here for the convenience of the reader:

$X = .98A + .85B + .50C - 56.07$

X = Reading Expectancy Level
A = Raw Score of STEP
B = Raw Score obtained from the Administration of the American School Achievement Test - Arithmetic Computation
C = Intelligence Quotient as Determined by the Primary Mental Abilities Test, Grades 4-6

The formula was employed in the following manner:

From the tests listed above, the scores made by the individual students were taken and inserted at the appropriate points in the formula. A raw score was then secured. This raw score was converted to a grade level score through the use of a conversion table derived from the Toussaint study. The resultant grade level score was considered to be the subjects REL (reading expectancy level.)

From tests listed in 3 above, the subjects actual reading level was determined. An average total score was computed from Forms I and II of the Gates Reading Survey Tests as directed in the test manual. The secured grade level scores from the two Gates Tests were averaged. The subsequent average grade level score was designated as the subject's Actual Reading Level (ARL) or composite reading grade equivalent. Through the use of the two derived scores above (i.e., reading expectancy level and actual reading level) the subjects were then placed into one or the other of the categories, reading achievers or reading retardates. The terms, reading achievers and reading retardates have been defined operationally in the section Definition of Terms (p. 15).

4. Further Evaluation of the Selected Subjects

During February of the years 1964, 1965, and 1966, the selected students were evaluated further through the administration of the following tests:

a. Spache Spelling Test
b. The McCullough Word-Analysis Test, Form I
c. Wepman Auditory Discrimination Test
d. Gilmore Oral Reading Test
e. The 1960 Revision of the Stanford-Binet Scale, Form L-M

5. The Standardized Routine of Experimental Procedures

During March, April, May and the early part of June of the calendar years 1964, 1965, and 1966, the selected subjects (in small groups and individually) were transported to the Leech Farms Veterans Hospital for the determination of the incidence of vocalism during a standardized routine of speaking, oral and silent reading. A detailed description of the standardized operating procedure will be found later in the chapter.

B. Nature of the Experimentees

From the approximately 1,200 children originally tested, 211 were selected for the study. Of these 95 were identified as reading retardates and 116 were identified as reading achievers. The following scores were recorded for the group:

The mean score for the reading achievers on the selection criteria (REL) was a 6.3 grade level score. The maximum score in the group was a 10.4 grade level and a minimum grade level was 2.6. The mean actual grade level score (ARL) for the achievers was 7.58 with a range of 7.7 grade levels. The maximum score was 11.3 and the minimum was 3.6.

The mean score for the reading retardates on the selection criterion (REL) was a 6.42 grade level score. The maximum score for the retardates was 11.5 grade level score and the minimum grade level score was 2.4. The range of grade level scores for the retardates was 9.1. The mean actual grade level score (ARL) for the retardates was 5.56 grade level score with a range of 7.6 grade level. The maximum score for the group was 10.1 and the minimum grade level score was 2.5.

As indicated in Table I, the reading achievers were reading at a mean of 1.27 grade levels above their reading expectancy level and the reading retardates were reading at a mean of .86 grade level below their reading expectancy level.

TABLE I

Summary Table of Reading Expectancy Level and Actual Reading Level Scores for the Achievers and Retardates Selected for the Experiment

	REL	ARL	N	Difference
Achievers	6.32	7.58	116	+1.27
Retardates	6.42	5.56	95	- .86

As indicated previously, five additional tests were administered to the two hundred and eleven experimentees. The following mean scores for the group were obtained:

> The mean intelligence quotient as determined by the 1960 Revision of the Stanford-Binet Scale, Form L-M, of the reading Retardates was 117. The mean Spache Spelling test raw score was 83.02. The mean raw score on the Wepman Auditory Discrimination test was 37.73. The total mean raw score on the McCullough Word-Analysis Test was 150.50. The total mean comprehension raw score on the Gilmore Oral Reading Test was 34.01. Table II below summarizes the scores on the five tests for the reading retardates.

TABLE II

Summary Table of Scores for
the Reading Retardates on
the Five Standardized Tests
N = 95

Name of Test	Mean Score
1. Revised Stanford-Binet Intelligence Scale, Form L-M	117.00
2. Spache Spelling	83.02
3. McCullough Word Analysis	150.50
4. Wepman Auditory Discrimination	37.73
5. Gilmore Oral Reading	34.01

> The following mean scores were recorded for the 116 reading achievers. The mean intelligence quotient score on the 1960 Revision of the Stanford-Binet Scale, Form L-M, was 118.26. The mean Spache Spelling Test raw score was 100.67. The mean raw score on the Wepman Auditory Discrimination Test was 37.81 out of a possible forty. The total mean raw score in the McCullough Word-Analysis Test was 169.81. The total mean comprehension raw score on the Gilmore Oral Reading Test was 37.92. Table II below summarizes the scores on the five tests for the reading achievers.

TABLE III

Summary Table of Scores for the
Reading Achievers on Final
Standardized Tests
N = 116

Name of Test	Mean Score
1. Revised Stanford-Binet Intelligence Scale, Form L-M	118.26
2. Spache Spelling	100.67
3. McCullough Word Analysis	169.81
4. Wepman Auditory Discrimination	37.81
5. Gilmore Oral Reading	37.92

C. Standard Operating Procedure for Recording Vocalism During Silent Reading

Following the administration and scoring of the above mentioned tests, the selected subjects were taken, singly and in small groups, to the Leech Farms Veterans Hospital for the recording of the incidence of vocalism during silent reading. Prior to the actual recording of the incidence of vocalism, there were a number of preliminary steps. The first of these steps was the operational check and calibration of the electronic equipment. Both weekly and daily operational checks were made. The specific steps in making these operational checks were as follows:

1. An external power source was connected to the pre-amplifiers and an input of 1.7 Volts was injected into the circuits of the pre-amplifiers.

2. An oscilloscope was connected to the output circuits of the same pre-amplifiers. The controls on the oscilloscope were adjusted for the measurement of a uniform output from each of the circuits of the D.C. pre-amplifiers. The output was adjusted through the oscilloscope power source of 100 microvolts, peak to peak. This standardized procedure ensured the uniform functioning of the pre-amplifier systems.

The specific steps in making the daily operational checks were as follows:

1. The power sources for every piece of equipment were checked.

2. Channels 1, 2, 3 and 8 of the Model 111 D were tested by noting the pen deflection in response to the G-Negative switch on the central channel control board of the Electroencephalographic Unit printout.

3. Channel 4, 5 and 6 of the Integrator Unit Model U 1-1 were checked so as to secure a wave, uniform in size for each channel on the Electroencephalographic Unit (Model III D) - a simulated printout.

4. Each Integrator (U 1-1) circuit, noted on channels 4, 5 and 6, was checked to see if an external input would be integrated. A 1.7 volt electric input was injected into the Integrator circuits and a simulated output wave shape was printed by the Electroencephalographic Unit (Model III D). The simulated output wave shape was measured to check the operating efficiency of both the Integrator circuits and the Model III D Electroencephalographic Unit.

5. The one second impulse or marker system, noted as a printout on the Electroencephalographic Unit (Model III D) as a blip, was checked.

6. The internal sound microphone system, Channel 9, was checked by noting the output impulses on the Electroencephalographic Unit (Model III D).

7. The printout, Channel 10, of the opening and closing of the three shutters on the front of the Metronoscope was noted and necessary adjustments made.

A second preliminary step to the recording of vocalism in silent reading was the selection of reading material. For the experiment, easy material was defined operationally as material with a readability level one and one-half grade levels below the experimentee's actual reading level; difficult material was defined operationally as material with a readability level at least one and one-half grade levels above the experimentee's actual reading level. Appropriate materials were selected for each experimentee according to the operational definition.

A third preliminary step prior to the recording of vocalism in silent reading was the time spent in establishing rapport with the experimentee. This involved giving each subject an informal introduction to the electronic equipment by explaining the function of each piece and permitting the subject to operate several switches. The rationale for this procedure was that some anxiety might have arisen as a consequence of feedback from classmates previously involved in the experiment.

Before describing the actual procedures of the experiment, mention must be made that different materials were presented in different forms and at different rates of speed to the different treatment groups, the reading achievers and the reading retardates. For the mechanical presentation (treatment) a variety of materials which were designed to be used on the metronoscope was presented to each subject. The material was narrative in style, and the content dealt with scientific, social studies, and literary stories, concepts, subjects, etc. The difficulty level or readability level of the material was determined through the use of the Yoakam Readability Formula. The levels (grade levels) of the material ranged from second grade through the eleventh grade level.

For the non-mechanical presentation (treatment) to a selected population of the experimentees, material similar in content and range of difficulty to the material used in the mechanical presentation was employed. The material used for the non-mechanical presentation was selected from graded series of reading texts, supplementary readers and literature texts, and was organized into an informal reading inventory as suggested by Betts (5). As with the mechanical presentation, this material was narrative in style and dealt with social studies, scientific and literary type of content. The range of readability levels of the material, somewhat congruent to the material for mechanical presentation, varied from the second grade level to the twelfth grade level.

In the following two tables, Tables IV and V, will be found the title of the material, the publisher, the publisher's reading grade placement, and the readability level as determined by the Yoakam Readability Formula (30).

The reading material presented via the Junior Model Metronoscope was run at increasingly faster rates. Because of the size of the type and the number of words per line, the reading material was presented at varying speeds. The initial rate at which the lines were presented was fifteen lines/minute. This rate was increased five lines per minute every thirty seconds until a maximum rate of fifty lines per minute was reached. The mean slow rate (first two minutes) was approximately 100 words per minute with a range of 70 words/minute, i.e., from 79 words per minute to 149 words/minute. The mean fast rate was approximately 200 words/minute with a range of 102 words/minute, i.e., from 125 words per minute to 227 words per minute. The word count for each story was determined by counting the number of words in each story. By noting the average number of words per line and multiplying that number by the number of lines presented each minute, it was possible to determine the mean slow rate (average first two minutes) and the mean fast rate (average of last two minutes) for each story that was presented mechanically. An examination of Table VI will reveal mean slow rate and mean fast rate for each story.

TABLE IV

Materials Used in the Mechanical Presentation and the Reading Grade Placements*

	Publisher's Reading Grade Placement	Yoakam Readability Grade Level
Gray Wolf	1B	2.6
Grunty	1A	2.8
Indian Scare	3A	3.6
A New Playmate	2A	3.8
Blind Eron's Tribe	4C	4.9
Strange Monkey Tricks	4B	5.5
Pack Rats	3B	6.3
Silk and Linen	5A	6.5
Ikhi, The Royal Gardner	5B	6.6
On Texas Cattle Trails	JHB	7.0
Snow Blind	6C	7.6
Coffee, Tea, and Cocoa	5C	7.7
Off to a Fresh Start	JHA	8.9
Flying Squirrel Gathers Bulrushes	6B	9.3
Sambo, The Tyrant	JHC	10.2
Odd Facts About Postage Stamps	SRH	11.0

*These Materials Accompanied the Metronoscope and were supplied by the American Optical Company

TABLE V

Materials Used in the Non-Mechanical Presentation and the Publisher, Publisher's Grade Level, and Yoakam Readability Level

Around Green Hills	1st Grade	2.0	ABC
Over A City Bridge	2nd Grade	3.0	ABC
Along Friendly Roads	3rd Grade	4.0	ABC
American Adventure	4th Grade	6.0	ABC
Adventures Here and There	5th Grade	9.0	ABC
Adventures Then and Now	6th Grade	5.6	ABC
Experiences in Reading and Thinking	7th Grade	10.0	M
Widening Views	8th Grade	9.0	AB
Understanding Literature	9th Grade	10.6	G
Types of Literature	10th Grade	10.0	G
American Literature	11th Grade	10.4	G
English Literature	12th Grade	12.0	G

Publisher's Key

ABC - American Book Company	G - Ginn
AB - Allyn and Bacon	M - MacMillan

TABLE VI

Rate of Presentation of Stories
Presented Mechanically

Title of Story	Mean Slow Rate (First 2 min.)	Mean Fast Rate (Last 2 min.)	Average Rate (Total 4 min.)
Gray Wolf	79	160	120
Grunty	70	125	100
Indian Scare	101	159	130
A New Playmate	93	164	128
Blind Eron's Tribe	122	227	174
Strange Monkey Tricks	130	219	175
Pack Rats	106	203	154
Silk and Linen	109	192	150
Iklu, The Royal Gardener	140	230	185
On Texas Cattle Trails	149	261	205
Snow Blind	149	224	187
Coffee, Tea and Milk	78	188	134
Off to a Fresh Start	107	189	148
Flying Squirrel Gather Bulrushes	89	174	182
Sambo, The Tyrant	91	202	151
Odd Facts About Postage Stamps	94	190	142
Mean Words/Min.	106	194	

Following the third preliminary step, that is, the establishment of rapport with the experimentees, was what might be called the fourth preliminary period, getting each subject ready for the attachment of the electrodes and the actual placement of the electrodes as described hereinafter. The sequence of steps prior to the attachment of the electrodes and the actual attachment of the electrodes was as follows:

1. The electrolytic paste was moistened with warm water.

2. The four areas where the electrodes were to be attached were cleaned with cotton (or gauze) and acetone.

3. The electrodes were cleaned and the surface next to the skin sanded if necessary.

4. Cotton (or gauze) moistened with warm water was held on the area where the electrodes would be attached for approximately ten seconds prior to the placement of the electrode.

5. The electrolytic paste was rubbed on the electrode placement area with the index finger for approximately 15-20 seconds.

6. Additional electrolytic paste was placed on the concave side of the electrode. The paste was placed on the electrode so a slight dome of paste was apparent.

7. The electrodes were attached to the placement area with either collodion or adhesive. (During the later part of the study - the last year - adhesive tape was used to secure the electrode to the skin.

8. The electrodes were attached in the following order:

    a. To the left ear lobe (the ground)
    b. Upper lip - placed midway between the midline and the corner of the mouth about 1 cm. above the upper lip line
    c. Corner of the mouth - placed approximately 1 cm. lateral to the corner of the lip
    d. Lower lip - placed midway between the midline and the corner of the mouth about 1 cm. below the lower lip line

9. Each electrode placement was checked for a maximum level of 15K ohms of resistance. The average resistance, as measured with an ohm meter, was 8K ohms or 8,000 ohms.

After each subject was prepared, as indicated above, the electronic equipment was again operationally checked and calibrated. After it was ascertained that the equipment was operating properly, the standardized routine of measuring vocalism during silent reading was initiated. This entailed speaking, oral reading, and silent reading. Specific instructions were given to each child for each of the following activities.

1. A thirty second calibration period preceded each experimental testing activity. The instructions to the subject were: "Please sit as quietly as possible while the equipment is being checked."*

*NOTE: During the obtaining of the incidence of vocalism for each subject, the total four (4) minutes of calibration was defined operationally as the Non-Reading Treatment.

2. The Bryngelson-Glaspey Picture Word Cards (which were previously photographed on 35 mm. color film) were shown to each subject after the following instructions were given: "When the picture is shown on the screen, I wan you to think what it is, (pause) then say it aloud. Please keep your eyes on the screen."

3. A thirty second calibration period followed item two. The following instructions were given: "Please sit as quietly as possible while the equipment is being checked."

4. The Wide Range Achievement Test, Vocabulary Words (which were previously photographed on 35 mm. black and white film) were presented to each subject with these instructions: "A word will appear on the screen in front of you. I want you to think the word, (pause) then say it aloud. Keep your eyes on the screen."

5. A thirty-second calibration period followed item four. The instructions to the experimentee were: "Please sit as quietly as possible while the equipment is being checked."

6. The Auditory Memory Span Test (sentences) of the Stanford Revision of the Binet Scale, Form L were presented to each child following these instructions: "I am going to say a sentence. When I am finished, I want you to think the sentence, (pause) then repeat it."

7. A thirty-second calibration period followed item six. The instructions were: "Please sit as quietly as possible while the equipment is being checked."

The next four activities of the standardized routine (see activities 8, 10, 12, and 14 below) followed four operational sequences: 8, 10, 12, 14; 12, 14, 8, 10; 14, 12, 10, 8; 10, 8, 14, 12. The different sequences were randomly assigned to the subjects to negate any possible effects of testing sequence.

8. The subjects were directed to read silently from easy reading material presented via the metronoscope (mechanical presentation).* The easy material was defined operationally as is noted in the description on page 16. The instructions were: "Read silently from the material on the machine. It will speed up from time to time. Read as carefully as you can. When you have finished, you will be asked questions on what you have read." The subjects read the material for four minutes, beginning at fifteen lines per minute and increasing five lines/minute every thirty seconds until the material was presented at 50 lines/minute. Five comprehension questions were asked when the subject had finished reading.

NOTE: The actual speed for the presentation of each story is noted in Table VI.

9. A thirty-second calibration period followed item eight. The instructions were: "Please sit as quietly as possible while the equipment is being checked."

10. The subjects read orally from easy reading material presented through the metronoscope (mechanically). Easy material was defined the same as it was in step eight. The instructions were: "Read orally from the material on the machine. You will be asked questions on what you have read, so read carefully." The subject read this material for four minutes. The speed at which the material was presented was described in step eight above. Five comprehension questions were asked when the subject had finished reading the selection.

11. A thirty-second calibration period followed item ten. The instructions were: "Please sit quietly as possible while the equipment is being checked."

12. The subjects read silently from difficult material presented via the metronoscope. Difficult material was defined operationally as is noted in the description on page 16. The instructions were: "Read silently from the material on the machine. You will be asked several questions on what you have read, so read carefully." The subject read for four minutes. The speed at which the material was presented was described in step eight above. Five comprehension questions were asked when the subject finished reading.

13. A thirty-second calibration period followed step twelve. The instructions were: "Please sit as quietly as possible while the equipment is being checked."

14. The subjects read orally from difficult material presented via the metronoscope (mechanically). The difficult material was defined operationally as is noted in the description on page 16. The instructions were: "Read orally from the material on the machine. You will be asked questions on what you have read, so read carefully." The speed at which the material was presented was described in step eight above. The subjects read for four minutes - the average of the first two minutes was defined as the slow rate; the average of the last four minutes was defined as the fast rate.* Five comprehension questions were asked when the subject had finished reading.

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*NOTE: The actual speed for the presentation of each story is noted in Table VI.

15. A thirty-second calibration period followed item fourteen. The instructions were: "Please sit as quietly as possible while the equipment is being checked."

16. The subject was asked to count from one to thirty silently. The instructions were: "Count from one to thirty. Count to yourself as I depress this key. Each time I press the key, count one number to yourself."

17. A thirty-second calibration period followed item sixteen. The instructions were: "Please sit as quietly as possible while the equipment is being checked."

18. The subject was asked to read silently from easy reading material which was organized in an informal reading inventory as suggested by Betts (5) (non-mechanical presentation). The instructions were: "Read silently from this material. You will be asked questions on what you have read, so read carefully." The material was given to the experimentee and he/she read at his/her own rate. Five comprehension questions were asked when the subject finished reading. Each subject read for a minimum of one minute from this easy material.

19. A thirty-second calibration period followed. The instructions were: "Please sit as quietly as possible while the equipment is being checked."

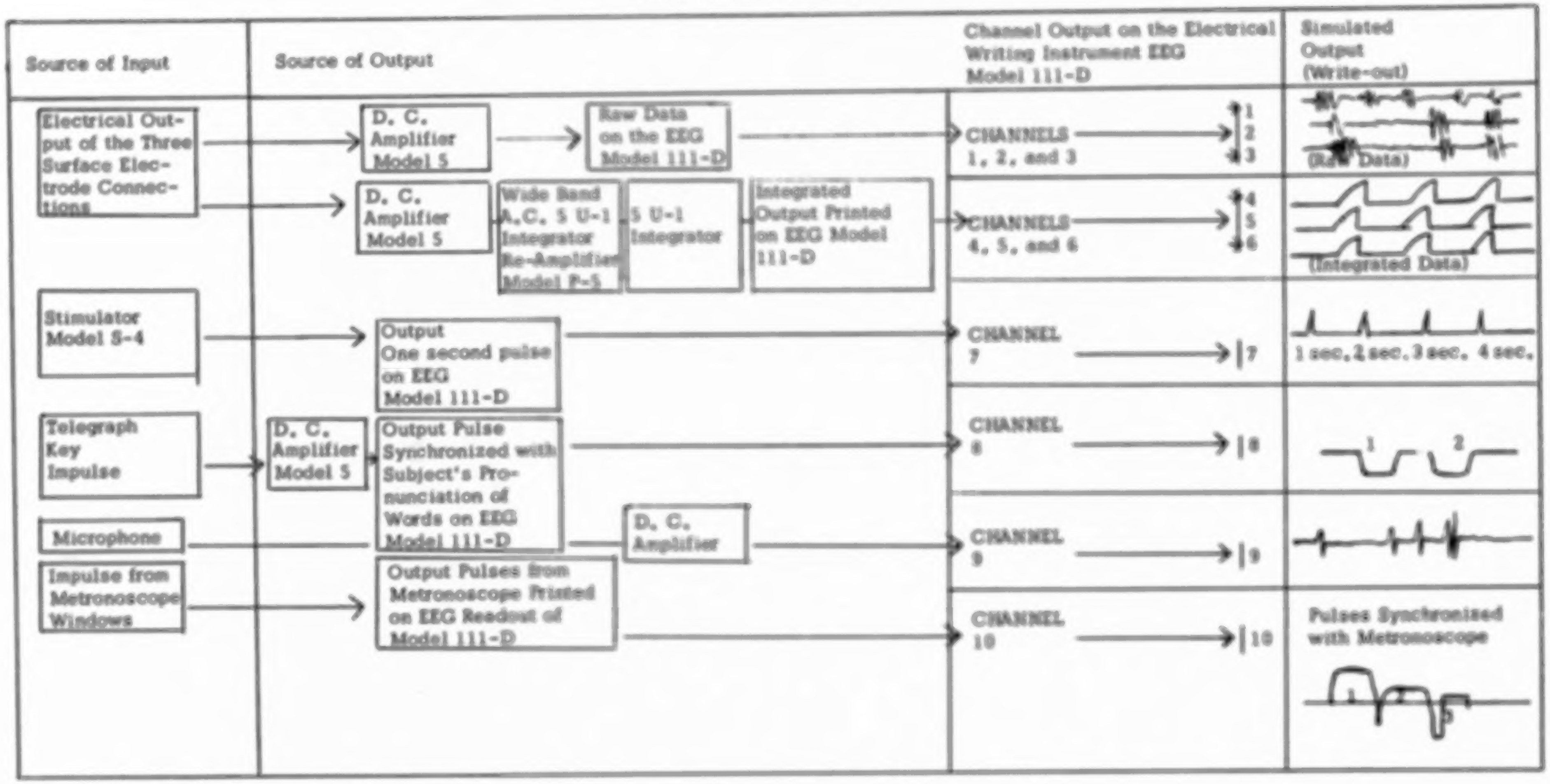
20. The subject was asked to read silently from difficult reading material which was organized in an informal reading inventory as suggested by Betts (5) and presented in text form. The instructions were: "Read silently from this material. You will be asked questions on what you have read, so read carefully." The material was given to the subject and he/she read at his/her own rate. Five comprehension questions were asked when the subject finished reading. Each subject read for a minimum of one minute from the difficult material.

21. A thirty-second calibration period followed. The instructions were: "Please sit as quietly as possible while the equipment is being checked."

22. After this final thirty-second calibration period, the electrodes were disconnected and the child was given a section of write-out as a souvenir.

Diagram I

Schematic Diagram of the Electronic Equipment
and Its Simulated Output


Source of Input
Source of Output
Channel Output on the Electrical Writing Instrument EEG Model 111-D
Simulated Output (Write-out)
Electrical Output of the Three Surface Electrode Connections
D. C. Amplifier Model 5
Raw Data on the EEG Model 111-D
CHANNELS 1, 2, and 3
1
2
3
(Raw Data)
D. C. Amplifier Model 5
Wide Band A.C. 5 U-1 Integrator Re-Amplifier Model P-5
5 U-1 Integrator
Integrated Output Printed on EEG Model 111-D
CHANNELS 4, 5, and 6
4
5
6
(Integrated Data)
Stimulator Model S-4
Output One second pulse on EEG Model 111-D
CHANNEL 7
7
1 sec. 2 sec. 3 sec. 4 sec.
Telegraph Key Impulse
D. C. Amplifier Model 5
Output Pulse Synchronized with Subject's Pronunciation of Words on EEG Model 111-D
CHANNEL 8
8
1
2
Microphone
D. C. Amplifier
CHANNEL 9
9
Impulse from Metronoscope Windows
Output Pulses from Metronoscope Printed on EEG Readout of Model 111-D
CHANNEL 10
10
Pulses Synchronized with Metronoscope
1
2
3

D. Recording and Quantifying the Data

1. Recording the Data

During the experimental procedures described in Part C, Standard Operating Procedures for Gathering Incidence of Vocalism During Silent Reading, electroencephalographic recordings were made for each subject. The individual myographic recordings were made on standard size electroencephalographic paper and was printed on a continuous strip of paper approximately four hundred (400) feet long. The specific myographic print-outs (simulated) are shown in Diagram I, Schematic Diagram of the Electronic Equipment Used in the Experiment and Its Simulated Output. This illustrates and describes the print-out from each of the ten channels of the Electroencephalograph Unit Model 111D (note schematia).

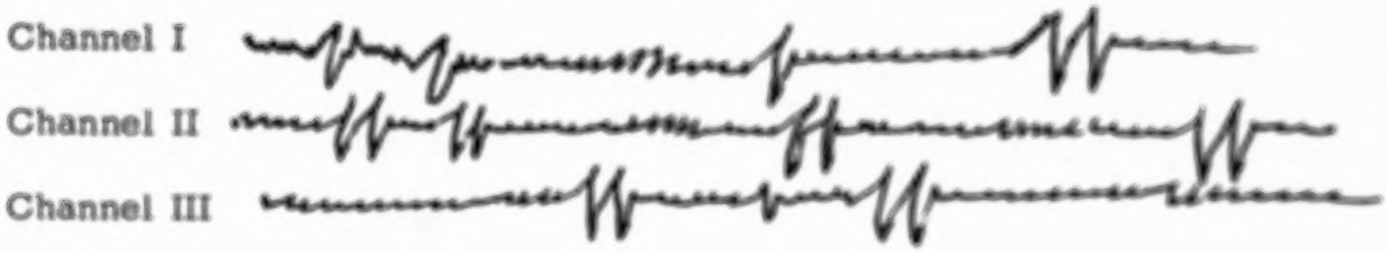
2. Quantifying the Data

As can be observed in Diagram I, the output from the three surface electrodes (channels 1 through 6) were dichotomized into channels 1, 2, and 3, which will be labeled as the raw Electromyographic data (EMG) and channels 4, 5, and 6, which was labeled as integrated data.

A closer look at Diagram I will reveal the following:

a. The muscle action potential (MAP) was picked up by the three surface electrodes. This was directed through a D.C. Amplifier, Model 5. After amplification it was directed into the EEG Model 111D, the output of which was the raw data as illustrated in Diagram II.

Diagram II*



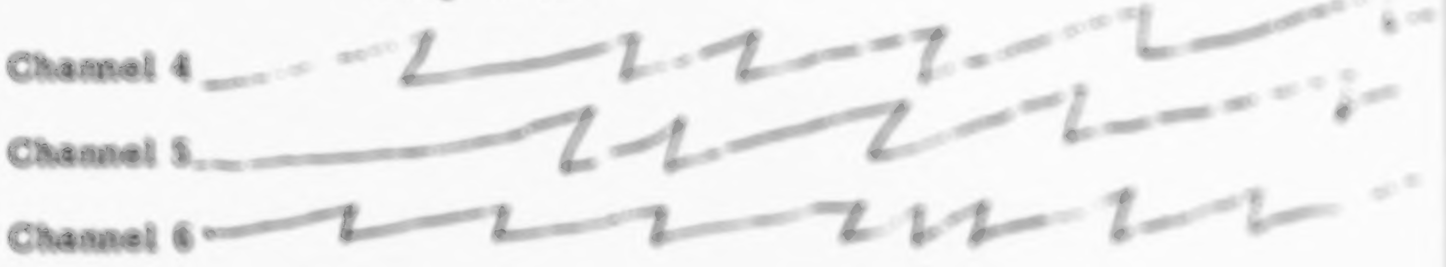
Other than noting the gross changes as indicated in the amplitude of the waves, it was impossible to quantify the raw data.

*Simulated Raw Muscle Action Potential Secured in the Three Channels

b. The MAP was directed into a second D. C. Amplifier Model 5. The amplified MAP was again directed into a Wide Band A. C. 5 U-1 Integrator Re-Amplifier Model P-5. From this instrument, the output was printed on the EEG paper.

Due to the unique functioning and output of the Integrator, it was now possible to quantify the amplified MAP's. The integrator unit (which acted as an electronic capacitor) was connected across each pair of surface electrodes attached to the lips as described elsewhere in this report. As with the output circuit of the raw data, bipolar recordings from the three electrode placements (channels 4, 5, and 6) were made. The integrator units were calibrated to discharge (ultimately, to print a specific and distinct output wave on the EEG recording paper) each time the Integrator U 1-1 reached a capacity level. The number of times the U 1-1 Integrator Units reached a capacity level and discharged (or a printed output wave known as an epoch) was proportional to the amount of vocalism (MAP) manifested by the individual experimentee. Diagram III illustrates the printed output waveshapes (epochs) produced by the output circuit of the Model U 1-1 Integrator through the Electroencephelograph Model III D.

Diagram III*



For the purposes of classification and illustration, it should be noted in the above diagram from the number of output waveshapes (epochs) that there was a greater manifestation of vocalism (greater MAP's) of the upper lip of the hypothetical experimentee. In the analysis of the data, the output waveshapes (epochs) were tabulated over equal periods of time.

c. The electrical current from the Stimulator Model S-4 was directed into the EEG unit. The output, was a series of blips, intervals of one second. Thus it was possible to compute the rate in words per minute at which each subject read the material (both mechanical and non-mechanical presentation). These blips were recorded via channel 7.

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*Simulated Output Waveshapes (Epochs) of Integrated Muscle Action Potential Secured in the Three Channels

d. A telegraph key activated an electrical impulse which was directed into a Model 5 D. C. Amplifier. The output was subsequently directed into the Model III D EEG unit. The final output was recorded by the ink-writing pen connected to channel 8. Thus the output pulse was synchronized with experimentee's pronunciation of words and the saying of the numbers 1 through 30.

e. A microphone was connected to a D. C. Amplifier. The output of the amplifier was then directed to the EEG unit. The print out, via channel 9, was a recording of the experimentee's voice during the oral part of the material presented mechanically and non-mechanically.

f. Micro-switches were installed in the Junior Model Metronoscope. These were so synchronized that the printouts, via channel 10, indicated the relative positions of the shutters of the Metronoscope. The opening and closing of the three shutters could be phased with the segment of a line of print exposed by the open shutter.

As mentioned previously, the output waveshapes (epochs) were tabulated over equal periods of time. It was possible, therefore, to tabulate these epochs because the printouts of channel 8 on the EEG Model III D were set to produce blips at one second intervals. The waves, or blips, were counted and arbitrarily divided into one-half minute periods for each of the treatments:

1. Mechanical Presentation - reading material presented via the Junior Model Metronoscope.

2. Non-mechanical presentation - reading material printed on sheets of paper 8 1/2 by 11 inches and presented to the experimentees as a teacher would present an open book to a child and ask him/her to read a selected page(s).

3. Non-reading (calibration) - in which the experimentees were instructed to sit as quietly as possible while the equipment was checked.

Thus, the total number of Integrated Waveshapes (epoch) for each of the thirty second periods were summed within the various treatments. The specific treatments, methods of presentation, and periods of time for each treatment were as indicated in the following diagram.

Diagram IV

Methods of Presentation	Period of Time
Mechanical Presentation	
Achievers	Four Minutes
Retardates	Four Minutes
Non-mechanical Presentation	
Achievers	Two Minutes
Retardates	Two Minutes
Non-reading (Calibration)	
Achievers	Four Minutes
Retardates	Four Minutes

Therefore, the incidence of vocalism for the three treatment groups were summed and analyzed as described in the following chapter.

IV. Findings

The findings are related to the objectives of the study as outlined in a previous chapter of this report and are based upon the results of the subjects measured behavior during specific activities of the testing protocol, namely, the mechanical and non-mechanical reading activity and a non-reading or calibration period.

In order to refresh the memory of the reader and for additional clarification, the specific variables derived from the two reading activities, and calibration period will be outlined here and again referred to as they pertain to the answering of each objective.

The mechanical presentation was made via the Junior Model Metronoscope. Each of the experimentees read material presented mechanically for a total of eight minutes. Half of this reading time, i.e., four minutes, involved the reading of material operationally defined as easy. Likewise, the remaining four minutes involved the reading of material operationally defined as difficult. The selection of the material was based on each experimentees actual reading level, i.e., the grade equivalent score obtained from the standardized reading tests.

The Metronoscope permitted the selection and control of the rate at which the material was presented to the subject. Both the easy and difficult materials were presented initially at a specific rate and this rate was increased in thirty second intervals over the four minutes of reading time. The mean rate of presentation during the first two and the last two minutes of each selection was labeled slow and fast respectively.

From the mechanical presentation, then, the following variables were derived:

1. Easy slow - two minutes
2. Easy fast - two minutes
3. Easy total - four minutes
4. Difficult slow - two minutes
5. Difficult fast - two minutes
6. Difficult total - four minutes
7. Slow total - four minutes
8. Fast total - four minutes
9. Total mechanical - eight minutes

A comprehension check followed each mechanical presentation. Variables derived from this activity were:

1. Easy comprehension - score obtained from questions asked following the reading of easy material.

2. Difficult comprehension - score obtained from questions asked following the reading of difficult material.

3. Total comprehension - total of scores obtained from the reading of both easy and difficult material.

The non-mechanical presentation involved the reading of material presented in textual form on a sheet of paper 8 1/2 by 11 inches. No effort was made to influence the subject's normal rate of reading. They were told to read the material as they would any interesting story or article.

The subjects read each of the two selections of the non-mechanical type; one defined as easy (again based on the subject's actual reading level) and one defined as difficult. A minimum of one minute reading time was recorded at each of the two levels for a total of two minutes on the non-mechanical presentation. (Note: A total of 158 subjects of the 211 were given the non-mechanical presentation. Of this number, 111 or 70 per cent, read for a minimum of two minutes at each level for a total of four minutes reading time.) From this data, the following variables were derived:

1. Non-mechanical easy - one minute

2. Non-mechanical difficult - one minute

3. Non-mechanical total - two minutes

A comprehension check also followed the non-mechanical presentation. From this data the following variables were derived:

1. Non-mechanical easy comprehension - questions which followed the reading of the easy material.

2. Non-mechanical difficult comprehension - questions which followed the reading of the difficult material.

3. Non-mechanical total comprehension - total score of all questions asked from the non-mechanically presented material.

It is to be noted that in the following tables, the N numbers will vary. This is due to attrition, as the testing encompassed a period of three years.

A. OBJECTIVE 1

To Determine the Incidence of Recorded Implicit Speech During Silent Reading Among a Selected Group of Intermediate Grade Children

To answer Objective No. 1, it was necessary to secure answers to the following sub-questions:

1. Is there a significant difference in the amount of recorded implicit speech during a reading and a non-reading activity?
2. Is there a significant difference in the amount of recorded implicit speech during the presentation of easy and difficult reading material?
3. Is there a significant difference in the amount of recorded implicit speech during the presentation of material at a slow and fast rate?

To answer the first question, comparisons were made between the amount of recorded implicit speech during the mechanical presentation of both easy and difficult reading material with the amount of implicit speech recorded during non-reading activity (calibration period), and furthermore, comparisons were made between the amount of recorded implicit speech during the non-mechanical presentation of reading material with the amount of recorded implicit speech during the non-reading activity (calibration period). For each of these comparisons, four minutes of recorded implicit speech were analyzed.

Table 7 shows the mean incidence of recorded implicit speech during the mechanical presentation of easy and difficult material and the mean incidence of implicit speech recorded during the non-reading activity (calibration period).

As indicated in Table VII, there are significant differences in the mean incidences of recorded implicit speech during the non-reading and reading activity. The difference between the incidence of recorded implicit speech during the presentation of easy reading material and the incidence of recorded implicit speech during the non-reading activity (calibration) is significant at the .01 level of confidence. The difference is significant at the .01 level of confidence, also, when the incidence of recorded implicit speech during the presentation of difficult material (reading activity) is compared with the non-reading activity (calibration). It should be noted, also, that there is a slight mean difference in recorded implicit speech between easy and difficult material, but this difference is not significant at either the .01 or .05 level.

Table VII

Mean Incidence of Recorded Implicit Speech During Reading Activity for Easy and Difficult Material and Non-Reading Activity (Mechanical Presentation)

	Implicit Speech (Epochs)			
Material	Reading Activity	Non-Reading Activity	N	t
Easy	235.37	185.14	210	5.92**
Difficult	232.29	185.14	210	5.32**

**p<.01

To answer the second question, namely: "Is there a significant difference in the amount of recorded implicit speech or vocalism during the mechanical presentation of easy and difficult material?" The data was further classified and analyzed to ascertain if the mechanical presentation of operationally defined easy and difficult material resulted in more implicit speech. Table VIII provides the following information.

Table VIII

Mean Incidence of Recorded Implicit Speech on Easy and Difficult Material Mechanically Presented
N = 210

Rate	Easy	Difficult	t
Slow	121.83	119.90	.74
Fast	113.55	112.38	.46
Total	235.37	232.29	.67

It is to be noted that more implicit speech was manifested during the reading of operationally defined easy material than during the reading of operationally defined difficult material, but that the differences are not significant at either the .01 or the .05 level of confidence. These findings are in opposition to that which was found by Edfelt (12). As stated elsewhere in this paper, he found that the reading of difficult material resulted in a greater degree of implicit speech. The reader should bear in mind that in this instance the material was presented mechanically, i.e., via the Junior Model Metronoscope.

In analyzing the results of the measured behavior of the experimentees on the non-mechanical reading activity, comparisons were made which paralleled those on the mechanical presentation. The rationale for comparing the incidence of vocalism or implicit speech during the silent reading of material presented non-mechanically (textual) was based upon the students' performance during the reading period. The subjects were directed "to read this as you would any interesting story or article." These directions and the students' reading habits resulted in the stories being read at varying rates of speed. Subsequently, the recorded measurements of implicit speech varied with each subject. For example, one subject read a story in one and one-half minutes, while another one read the same story in four minutes. In general, across subjects, the minimal amount of recorded implicit speech for the two levels of material, easy and difficult, was approximately one minute each and the maximal amount for the two levels was approximately four minutes each. As each child read, lines were drawn with a red pencil at thirty second intervals. Thus, it was possible to count the waveshape forms (epochs) for each thirty-second interval. The blips, as mentioned earlier, facilitated the counting of the epochs for each thirty-second interval of time.

Comparisons were made between the non-reading (calibration) and the reading of the textual material (non-mechanical presentation). The latter consisted of a minimum of one minute reading time spent on each of two levels of material -- easy and difficult -- for a total non-mechanical reading time of at least two minutes. Seventy per cent of the experimentees reading the textual material (non-mechanical presentation) spent a minimum of two minutes at each level, resulting in a total of four minutes. Table IX indicates the means for the non-mechanical presentation and the means of the calibration period expressed in thirty-second intervals.

It should be noted that in all but the first period for each type of material, easy and difficult, more implicit speech was manifested in intervals 2, 3, and 4. Further analysis was made by comparing the mean manifestation of recorded implicit speech on both the easy and difficult materials with the calibration period. (Note: The numbers represent the average number of epochs for a reading time of one minute, as some of the experimentees read the material (easy or difficult) in less than two minutes each. Again, as revealed by Table X, it is to be noted that more implicit speech was manifested during the calibration.

Table IX

Mean Incidence of Recorded Implicit Speech on Non-Mechanical Presentation and Calibration in Thirty-Second Intervals

Type of Material	Interval (30 seconds)	Non-Mechanical Presentation	Calibration	N	t
Easy	1	21.49	21.34	158	.43
Easy	2	20.86	23.19	158	3.58**
Easy	3	21.56	25.00	112	3.63**
Easy	4	19.98	23.96	111	5.14**
Difficult	1	23.30	24.12	153	.83
Difficult	2	19.86	24.00	153	4.75**
Difficult	3	20.84	23.66	108	2.51*
Difficult	4	19.37	23.74	107	5.03**

*$p < .05$ **$p < .01$

Table X

Mean Incidence of Recorded Implicit Speech on Non-Mechanical Presentation for Easy and Difficult Material and Calibration (Non-Reading)

Level	Reading Time	Non-Mechanical Presentation	Calibration	N	t
Easy	1 minute	42.76			
Difficult	1 minute	42.88			
Total	2 minutes	85.10	93.27	159	3.57**

**$p < .01$

To answer the third question related to Objective 1, the data was classified further according to rate of presentation to determine if differences exist in the incidence of vocalism as a function of rate. The material presented mechanically to the experimentees was increased in rate of presentation in thirty-second intervals. The first two minutes of the total four minute presentation at each level was defined as slow, and the last two minutes as fast. Table XI shows the mean incidence of implicit speech on the easy material at the two rates and the calibration mean.

Table XI

Mean Incidence of Recorded Implicit Speech on Easy Material Presented Mechanically at a Slow and Fast Rate and Calibration
N = 210

Rate	Incidence of Implicit Speech	Calibration	t
Slow	121.83	93.27	6.78**
Fast	113.55	93.27	4.63**

**p < .01

Table XI indicates that there is a significant difference between the mean measured muscle action potential (MAP) on easy material read at the two rates and the calibration mean. It should be noted that the mean incidence of implicit speech decreased from the slow and fast rate.

Table XII shows the mean incidence of implicit speech on the operationally defined difficult material at the two rates of presentation and the mean calibration.

Table XII

Mean Incidence of Recorded Implicit Speech on Difficult Material Presented Mechanically at Slow and Fast Rates and Calibration
N - 210

Rate	Incidence of Implicit Speech	Calibration	t
Slow	119.90	93.27	6.11**
Fast	112.38	93.27	4.22**

**p < .01

As on the easy material, there is a significant difference, at the .01 level of confidence, between the mean measured MAP on difficult material at the two operationally defined rates and the calibration mean. Also, it is to be noted that there is a decrement in the mean incidence of implicit speech from the slow to the fast rate.

Further analysis of the recorded incidence of implicit speech as a function of rate on the mechanically presented material revealed that on the easy and difficult material, more implicit speech was manifested at the slow rate. Table XIII shows the means at the two levels for the two rates. It should be noted that for both easy and difficult material, significantly more implicit speech or vocalism was manifested while the experimentees read slowly.

Table XIII

Mean Incidence of Recorded Implicit Speech on Easy and Difficult Material Presented Mechanically at Slow and Fast Rate

Level	Slow	Fast	N	t
Easy	121.83	113.55	210	5.23**
Difficult	119.90	112.38	210	4.08**
Total	241.25	226.36	209	5.99**

**p <.01

As indicated by the three tables, namely, XI, XII and XIII, more implicit speech or vocalism was manifested during a reading activity than during a non-reading activity on both easy and difficult material and more implicit speech was manifested at the slow rate than at the fast rate. It should be noted also that the mean differences, in all instances, were significant at the .01 level of confidence.

B. OBJECTIVE 2

To Determine Which of Two Groups of Children, the Reading Achievers or the Reading Retardates, Manifest a Higher Incidence of Recorded Implicit Speech During Silent Reading

To answer objective 2 it was necessary to answer the following questions:

1. Do the reading achievers or the reading retardates manifest a higher incidence of recorded implicit speech during the mechanical presentation of reading material?
2. Do the reading achievers or the reading retardates manifest a higher incidence of recorded implicit speech during the non-mechanical presentation of reading material?

To find answers to the first question, the results of the recorded incidence of implicit speech on the mechanical presentation for the achievers and retardates were analyzed in terms of level of material, easy and difficult, and rate of presentation.

Table XIV indicates that the retardates had a greater manifestation of recorded implicit speech on both easy and difficult material than did the achievers. This difference was significant at the .05 level of confidence on the easy material and the total of easy and difficult material.

Table XIV

Mean Incidence of Recorded Implicit Speech for Achievers and Retardates on Easy and Difficult Material Presented Mechanically

	Implicit Speech			
Material	Achievers	Retardates	N	t
Easy	217.43	257.33	209	2.04*
Difficult	214.11	254.52	209	1.93
Total	431.54	511.85	209	2.04*

*p <.05

It is to be noted again that both achievers and retardates manifested more recorded implicit speech on the easy material than on the difficult material. However, the difference was slight for both groups and not significant at the .05 level.

On analyzing the difference between the two groups of students, the retardates and the achievers - on mean rate of presentation - slow and fast, the retardates again manifested a greater incidence of recorded implicit speech. This difference was significantly different at both slow and fast rates and for the total - the sums of both slow and fast rates.

A further analysis of the two groups, retardates and achievers, was based upon rate of the mechanical presentation of the reading material. Again, the retardates manifested a higher incidence of recorded implicit speech. Table XV shows that the difference was significant at the .05 level at mean slow and fast rate, as well as the sums of slow and fast rate.

Table XV

Mean Incidence of Recorded Implicit Speech for Achievers and Retardates on Material Presented Mechanically at Slow and Fast Rates

	Mean Implicit Speech			
Rates	Achievers	Retardates		t
Slow	223.04	263.53	209	2.05*
Fast	208.50	248.49	208	1.98*
Total	431.54	511.85	209	2.04*

*p < .05

A further analysis of the two groups was based upon rate of presentation of operationally defined easy material. Table XVI shows the mean manifestation of recorded implicit speech on easy material presented mechanically. At both rates, the retardates exhibited a higher incidence of implicit speech. However, there was a significant difference only in the slow rate of presentation and the total at the .05 level of confidence.

Table XVI

Mean Incidence of Recorded Implicit Speech of Achievers and Retardates on Easy Material Mechanically Presented at Slow and Fast Rates
N = 209

Rates	Achievers	Retardates	t
Slow	111.89	133.99	2.24*
Fast	105.54	123.34	1.79
Total	217.43	257.33	2.04*

*p <.05

On the difficult material presented mechanically to the two groups, the retardates, again exhibited more recorded implicit speech than the achievers. Table XVII reveals, however, that the differences were not statistically significant at the .05 level of confidence.

Table XVII

Mean Incidence of Recorded Implicit Speech of Achievers and Retardates on Difficult Material Presented Mechanically at Slow and Fast Rates
N = 209

Rate	Achievers	Retardates	t
Slow	111.16	130.61	1.85
Fast	102.96	123.91	1.95
Total	214.11	254.52	1.93

To answer the second question, "Do the Reading Achievers or the Reading Retardates manifest a higher incidence of recorded implicit speech during the non-mechanical presentation of reading material," comparisons were made between the mean incidence of recorded implicit speech of retardates and

2

achievers on both easy and difficult material. The results from the analysis of the data were similar to those found on the mechanical presentation. Table XVIII indicates that the retardates, as a group, manifested a greater mean incidence of recorded implicit speech on both easy and difficult material, but the difference was not significant.

Table XVIII

Mean Incidence of Recorded Implicit Speech for Achievers
and Retardates on Easy and Difficult Material
Presented Non-Mechanically

Level of Material	Implicit Speech Achievers	 Retardates	N	t
Easy	40.32	46.17	158	1.69
Difficult	40.72	45.91	156	1.33
Total	80.60	91.38	158	1.53

A summary of the findings from the data presented in Tables XIV, XV, and XVI, XVII, and XVIII is as follows:

1. The retardates manifested more recorded implicit speech on both easy and difficult material, and at both slow and fast rates. This same finding was obvious whether the material was presented mechanically or non-mechanically.

2. That both retardates and achievers manifested more recorded implicit speech on easy material than on difficult material when the material was presented mechanically. When the material was presented non-mechanically, retardates manifested more implicit speech on both easy and difficult material. However, the difference was not significant.

C. OBJECTIVE 3

To Determine the Relationship Between the Incidence of Recorded Implicit Speech During Silent Reading and Reading Rate

As noted previously, the experimentees read two selections -- one defined operationally as easy material and a second selection defined operationally as difficult. Both selections were presented mechanically, and the experimentees read each selection for a total of four minutes, with the rate of presentation being increased every thirty seconds. Thus, eight continuous measures of recorded implicit speech were obtained for each experimentee for both the easy and difficult material. Table XIX presents the mean recorded incidence of implicit speech and the mean rate of presentation for each level.

Inspection of Table XIX reveals that there is a decrement trend in recorded incidence of implicit speech as rate of presentation increases. On easy material the lowest incidence of vocalism was recorded at the eighth thirty second period. On the difficult material, it was recorded at the fifth thirty second period. Over all, there appears to be an inverse relationship between incidence of recorded implicit speech and rate of presentation.

Table XIX

Mean Incidence of Recorded Implicit Speech of Mechanically Presented Material in Thirty Second Intervals and Mean Rate of Presentation in Words Per Minute For Achievers and Retardates

	Implicit Speech		
Increments	Easy	Difficult	Rate Words/Minute
First	33.67	32.69	87.69
Second	29.61	29.48	106.94
Third	29.23	29.31	125.19
Fourth	29.29	28.43	144.44
Fifth	29.07	27.63	163.68
Sixth	28.32	28.57	182.93
Seventh	28.28	27.91	202.18
Eighth	28.01	28.34	221.43

N = 211

Separate analysis of the relationship between the incidence of implicit speech and rate of presentation were completed for reading achievers and reading retardates. Table XX presents the mean recorded incidence of implicit speech and the mean rate of presentation for reading achievers.

Table XX

Mean Incidence of Recorded Implicit Speech of Mechanically Presented Material in Thirty Second Intervals and Mean Rate of Presentation in Words Per Minute for Achievers
N = 116

Increments	Implicit Speech Easy	Implicit Speech Difficult	Rate Words/Minute
First	31.75	30.70	87.69
Second	27.04	26.80	106.94
Third	25.97	27.00	125.19
Fourth	27.12	26.66	144.44
Fifth	26.40	24.97	163.68
Sixth	26.48	26.17	182.93
Seventh	26.83	25.70	202.18
Eighth	25.82	26.35	221.43

It is noted that there is a decrement in epochs (implicit speech) as the rate increases.

The retardates manifested the same pattern, i.e., there was a decrement in recorded implicit speech as the rate of presentation of the material was increased. Table XXI reveals that the retardates manifested more recorded implicit speech at the first increment level, and that the greatest decrement was noted in the reading of the easy material.

Table XXI reveals that there is a decrement in epochs (implicit speech) for both easy and difficult material.

The findings indicate that there is a decrement in implicit speech as the rate of presentation increases. There is an inverse relationship between recorded implicit speech and the rate of presentation of the material. The findings were similar for retardates and achievers with reading materials operationally defined as easy and difficult.

Table XXI

Mean Incidence of Recorded Implicit Speech of Mechanically Presented Material in Thirty Second Intervals and Mean Rate of Presentation in Words Per Minute for Retardates
N = 95

	Implicit Speech		
Increments	Easy	Difficult	Rate
First	36.07	35.13	87.69
Second	32.76	32.76	106.94
Third	33.21	32.14	125.19
Fourth	31.95	30.59	144.44
Fifth	32.33	30.87	163.68
Sixth	30.57	31.51	182.93
Seventh	30.04	30.62	202.18
Eighth	30.72	30.79	221.43

D. OBJECTIVE 4

To Determine at Which Rate of Presentation There is a Minimal Manifestation of Recorded Implicit Speech During Silent Reading

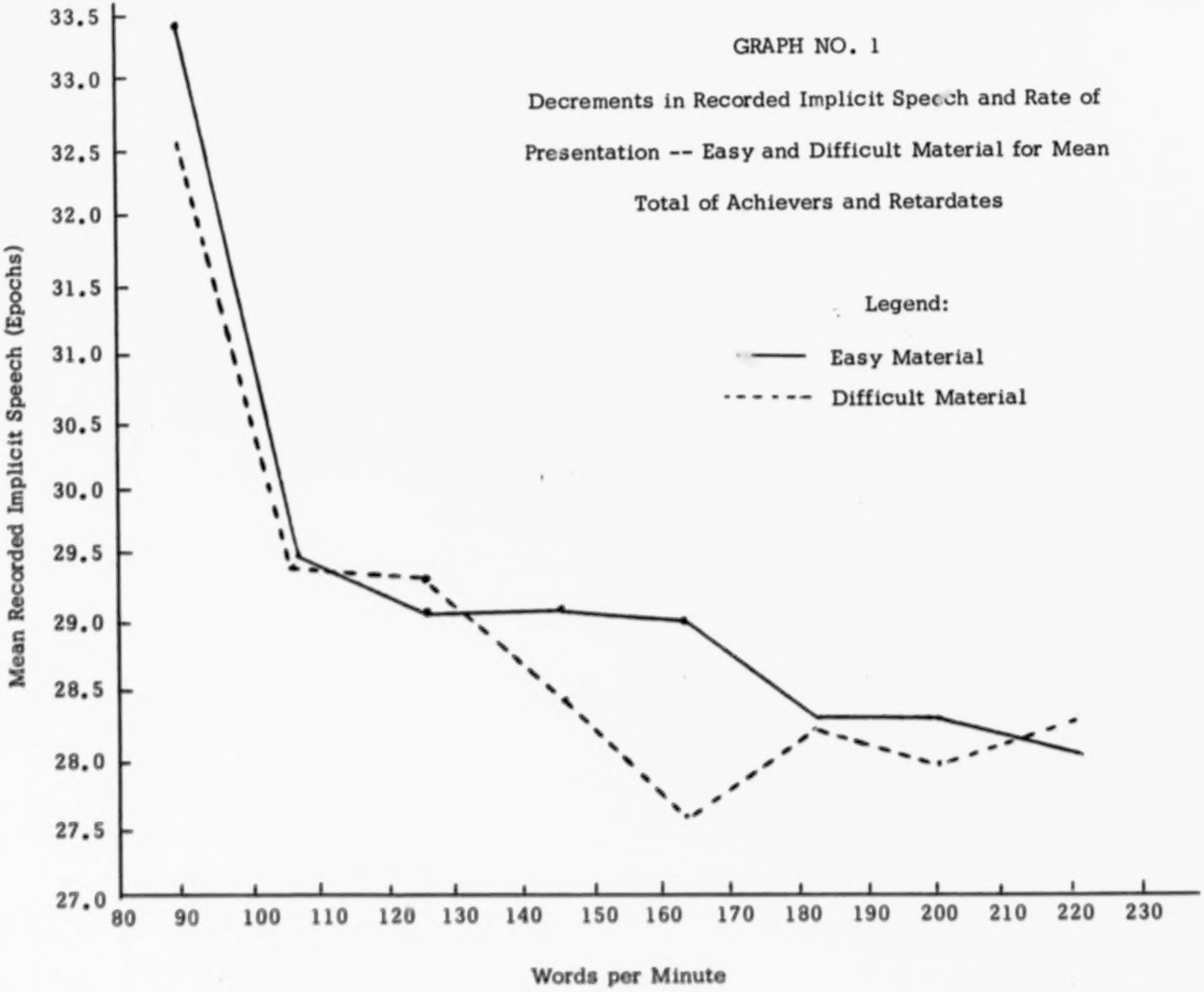
The following graphs will show the recorded implicit speech and the rate of presentation during each of the thirty second intervals.

While interpreting these graphs, the reader should refer to tables XIX, XX, and XXI. Graph 1 reveals that while increasing the rate of reading from approximately 87 words/minute to 107 words/minute there was the greatest decrement of implicit speech. From approximately 107 words/minute to approximately 182 words/minute, there was some decrement in implicit speech; however, from 182 words/minute to the limit of the machine, i.e., approximately 220 words/minute, there was less of a decrement in implicit speech.

Graph 2 depicts the decrements in implicit speech for the retardates. It is noted that at each interval of increased rate of presentation there was a decrement in recorded implicit speech up to approximately 200 words/minute. It is noted also that an increase of 20 words per minute resulted in more recorded implicit speech. Based on the data presented, minimal recorded implicit speech occurred at a rate of approximately 200 words/minute.

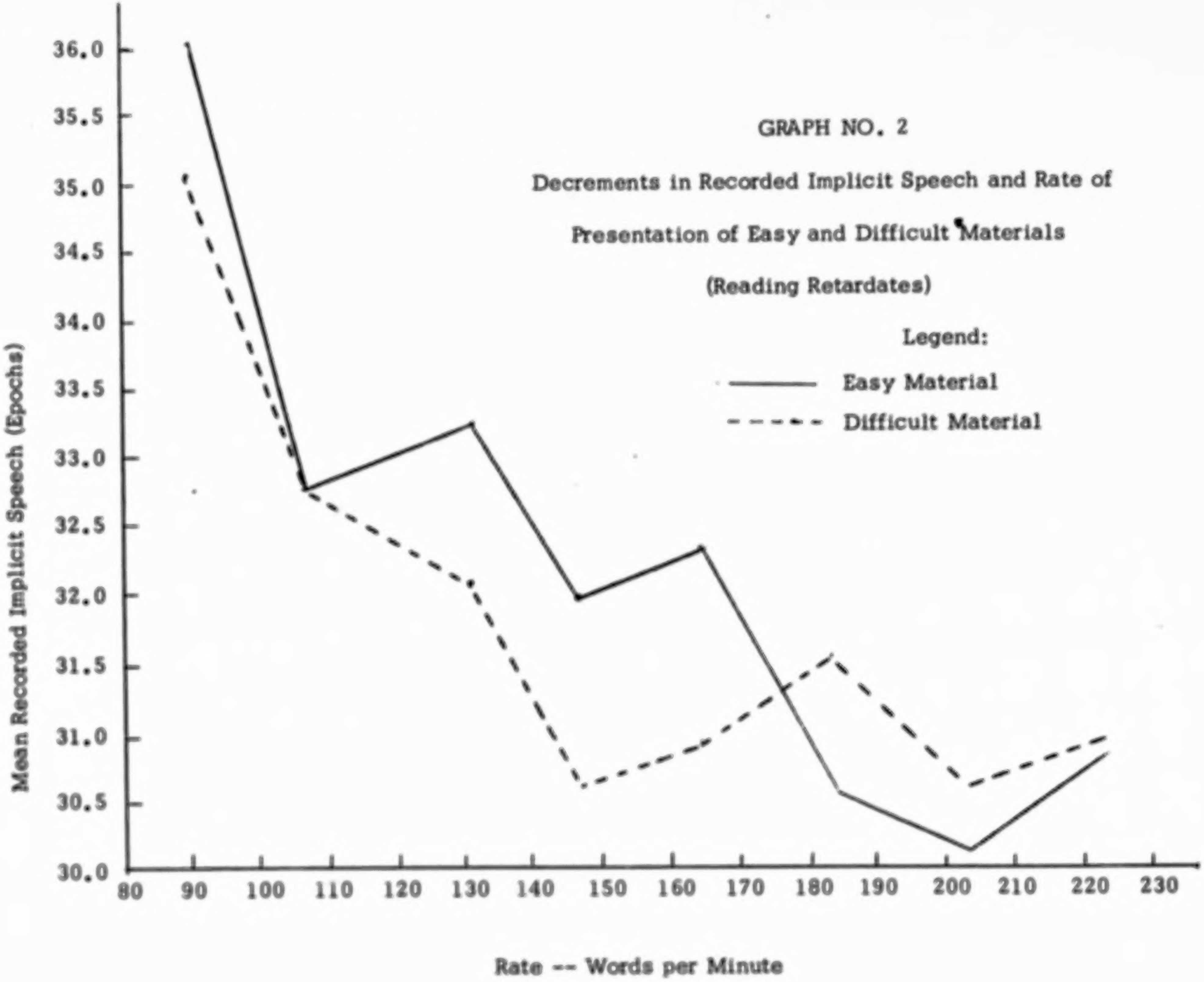
Graph 3 on the other hand reveals a slightly different pattern. All three graphs revealed that more recorded implicit speech was manifest while the experimentees were reading operationally defined easy reading material. It is noted also that there was a rather sharp decline in incidence of recorded implicit speech from approximately 87 words/minute to approximately 107 words/minute. Again, as Graph 3 reveals, there was no appreciable decrement in recorded implicit speech as the rate of presentation of both easy and difficult material exceeded approximately 100 words/minute, but there appeared to be more implicit speech while the experimentees read operationally defined easy material.

Based on the data presented in Tables XIX, XX, and XXI and Graphs 1, 2 and 3, there was a sharp decrement in mean recorded implicit speech from a mean rate of 88 words per minute to 107 words per minute, but that subsequent decrements were not nearly as marked. From the data listed it was not possible to provide a definitive answer to the question raised by Objective 4, i.e. "at which rate of presentation is there a minimal manifestation of recorded implicit speech during silent reading?"



GRAPH NO. 1

Decrements in Recorded Implicit Speech and Rate of Presentation -- Easy and Difficult Material for Mean Total of Achievers and Retardates



GRAPH NO. 2

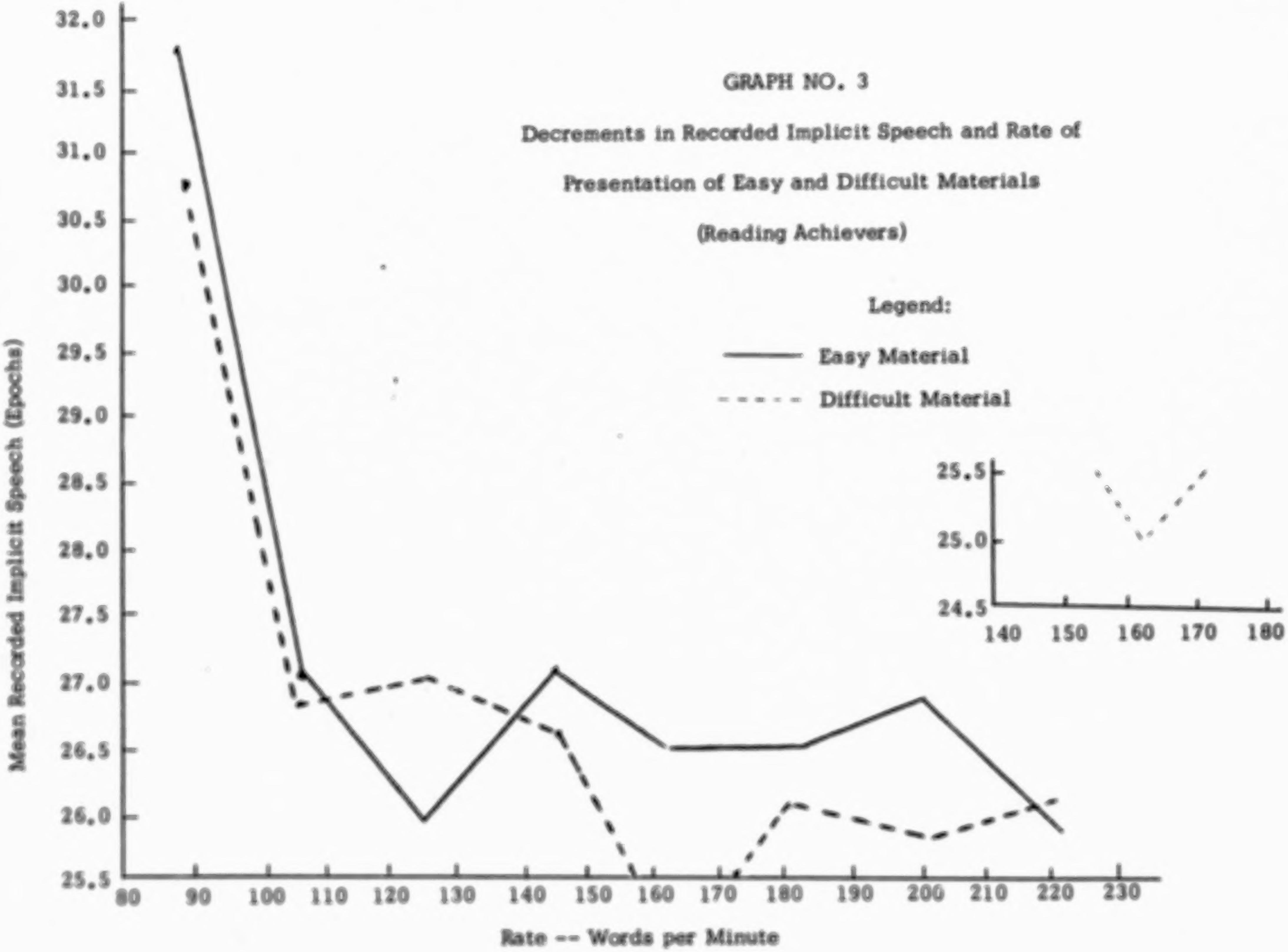
Decrements in Recorded Implicit Speech and Rate of Presentation of Easy and Difficult Materials

(Reading Retardates)

GRAPH NO. 3

Decrements in Recorded Implicit Speech and Rate of Presentation of Easy and Difficult Materials

(Reading Achievers)



E. OBJECTIVE 5

To Determine the Relationship Between the Incidence of Recorded Implicit Speech (Vocalism) during Silent Reading and Efficiency of Comprehension

To answer the fifth objective, it was necessary to answer the following questions:

1. What is the relationship between mean total incidence of recorded implicit speech and efficiency of comprehension?
2. What is the relationship between mean incidence of recorded implicit speech and efficiency of comprehension when comparisons are made between two methods of reading instruction, namely, Basal (Method I) and Basal with Supplementary Phonics (Method II)?
3. What is the relationship between selected measures of recorded implicit speech and efficiency of comprehension?

To find an answer to the first question comparisons were made between achievers and retardates when the reading material was presented both mechanically and non-mechanically and efficiency of comprehension. These comparisons were made on both easy and difficult reading material.

Table XXII shows the mean incidence of implicit speech and comprehension on the mechanical presentation of easy material.

Table XXII

Mean Incidence of Recorded Implicit Speech and Comprehension Scores for Achievers and Retardates on Easy Material Presented Mechanically

	Achievers	Retardates	N	t
Implicit Speech (Epochs)	217.43	257.33	209	2.04*
Comprehension	3.75	4.11	211	2.42*

*p <.05

The data indicates that for the easy material presented mechanically there was a significant difference of recorded implicit speech between the achievers and the retardates. The difference was significant at the .05 level of confidence. Also, the retardates made significantly higher scores on the comprehension of easy material. This difference also, was significant at the .05 level of confidence.

Table XXIII

Mean Incidence of Recorded Implicit Speech and Comprehension Scores for Achievers and Retardates on Difficult Material Presented Mechanically
N = 209

	Achievers	Retardates	t
Implicit Speech (Epochs)	214.11	254.52	1.93
Comprehension	3.03	2.67	1.93

From Table XXIII which shows the mean incidence of recorded implicit and comprehension scores on difficult material presented mechanically, it is noted that the retardates manifested more recorded implicit speech than do the achievers on difficult material, but the difference was not significant at either the .05 or .01 level of confidence. This was contrary to what was found on the reading of easy material. Also contrary to what was found on the reading of easy material was the fact that the achievers comprehension efficiency was greater than the retardates. Again, it is noted that slightly more implicit speech was manifested while both achievers and retardates read easy material.

Comparisons were made between recorded implicit speech and comprehension scores for both achievers and retardates on total mechanical presentation. Table XXII shows total manifestation of recorded implicit speech and efficiency of comprehension for both achievers and retardates.

Table XXIV

Mean Incidence of Recorded Implicit Speech and Comprehension Scores for Achievers and Retardates on Total Mechanical Presentation

	Achievers	Retardates	N	t
Implicit Speech (Epochs)	431.54	511.85	209	2.04*
Comprehension	6.78	6.75	211	.15

*p <.05

As would be expected from data previously presented, the retardates manifested more implicit speech than the achievers on total mechanical presentation (easy plus difficult) than the achievers. Comprehension scores obtained by the achievers and the retardates, considered separately, are approximately equivalent.

The same comparisons were made on the non-mechanical presentation. Tables XXV and XXVI show the data obtained on the silent reading of easy and difficult material.

Table XXV

Mean Incidence of Recorded Implicit Speech and Comprehension Scores for Achievers and Retardates on Easy Material Presented Non-Mechanically

	Achievers	Retardates	N	t
Implicit Speech (Epochs)	40.32	46.17	158	1.69
Comprehension	7.17	6.79	155	1.11

It is noted, that on easy material presented non-mechanically, the achievers manifested less implicit speech and comprehended better than did the retardates. The differences were not significant at either the .05 or .01 level of confidence.

Table XXVI reveals the efficiency of comprehension and recorded implicit speech on the reading of difficult material presented non-mechanically. Data for both achievers and retardates are listed.

Table XXVI

Mean Incidence of Recorded Implicit Speech and Comprehension Scores for Achievers and Retardates on Difficult Material Presented Non-Mechanically

	Achievers	Retardates	N	t
Implicit Speech (Epochs)	40.73	45.91	156	1.33
Comprehension	4.95	4.87	152	.21

It is noted that the differences between the mean recorded implicit speech for the achievers and retardates was not significant at the .05 level of confidence. The achievers made a higher mean score on comprehension, but the difference was not significant at the .05 level of confidence.

Comparisons were made also on the total non-mechanical presentation (easy plus difficult) between the achievers and retardates. Table XXVII shows the mean incidences of recorded implicit speech and total mean comprehension scores.

Table XXVII

Mean Incidence of Recorded Implicit Speech and Comprehension Scores for Achievers and Retardates on Total Non-Mechanical Presentation
N = 158

	Achievers	Retardates	t
Implicit Speech (Epochs)	80.60	91.38	1.53
Comprehension	12.07	11.44	1.19

When considering total mean scores on both mean recorded implicit speech and comprehension scores, the retardates manifested more recorded implicit speech, but the achievers made better comprehension scores. Neither difference was significant at the .05 level of confidence.

In summary, previous tables revealed the following information. On material presented mechanically, the retardates manifested more recorded implicit speech on both easy and difficult; but they made better comprehension scores only on easy material, the achievers made better comprehension scores on the difficult material. When the experimentees read difficult material presented mechanically the retardates manifested more recorded implicit speech but the achievers had higher mean comprehension scores. However in reading the easy and difficult material presented non-mechanically, the retardates had higher mean incidences of implicit speech but the achievers were able to comprehend both types of material better.

To answer the second question - "What is the relationship between mean incidence of recorded implicit speech and efficiency of comprehension when comparisons were made between two approaches of reading instruction, namely, Basal vs Basal with Supplementary Phonics" comparative analyses of implicit speech and comprehension scores were completed.

One portion of the student population had received early reading instruction in which the materials of instruction were the Scott-Foresman Basal Series. This segment of the population will be referred to hereinafter as Method I. Another segment of the student population had received reading early instruction in which the materials of instruction were the Scott-Foresman Basal Series supplemented with the Phonetic Keys to Reading, published by the Economy Press Company. This approach will be referred to hereinafter as Method II.

Table XXVIII reveals the mean incidence of recorded implicit speech and comprehension scores when comparisons were made between Method I and Method II.

Table XXVIII

Mean Incidence of Recorded Implicit Speech and Comprehension Scores for Method I and Method II on Easy Material Presented Mechanically

	Method I	Method II	N	t
Implicit Speech (Epochs)	295.09	163.72	209	7.52**
Comprehension	4.05	3.74	211	2.11**

**p < .01

It is noted that the subjects in Method I manifested more recorded implicit speech than those in Method II; and that those in Method I made a better mean comprehension score. In both instances, the difference was significant at the .01 level of confidence, favoring those subjects in Method I.

Likewise a similar comparison was made when the subjects read difficult material presented mechanically. Table XXIX reveals the data obtained when comparisons were made between Methods I and II.

Table XXIX

Mean Incidence of Recorded Implicit Speech and Comprehension Scores for Method I and Method II on Difficult Material Presented Mechanically

	Method I	Method II	N	t
Implicit Speech (Epochs)	289.42	163.73	207	6.55**
Comprehension	3.22	2.46	209	4.13**

**p $<$.01

The data in Table XXIX parallels the information found in Table XXVIII. It is noted that the subjects receiving instruction in Method I exhibited more recorded implicit speech than those in Method II. Also, those in Method I achieved a higher mean score in comprehension. In both instances, the differences were significant at the .01 level of confidence favoring Method I.

Comparisons were made also between Method I and Method II on total mechanical presentation (easy plus difficult).

The data revealed in Table XXX presents the same pattern as shown in Tables XXVIII and XXIX. The experimentees taught with instructional materials as described in Method I manifested more recorded implicit speech and obtained a higher mean comprehension score than those in Method II. Both differences were significant at the .01 level of confidence.

Table XXX

Mean Incidence of Recorded Implicit Speech and Comprehension Scores for Method I and Method II on Total Mechanical Presentation

	Method I	Method II	N	t
Implicit Speech (Epochs)	584.51	327.44	209	7.24**
Comprehension	7.25	6.21	211	4.26**

**p $<$.01

Comparisons were also made between Method I and Method II on easy and difficult material which was presented non-mechanically. Table XXXI reveals data secured while the experimentees read easy material.

Table XXXI

Mean Incidence of Recorded Implicit Speech and Comprehension Scores for Method I and Method II on Easy Material Presented Non-Mechanically

	Method I	Method II	N	t
Implicit Speech (Epochs)	44.58	38.47	158	1.63
Comprehension	7.23	6.52	155	1.94

The data in the above Table parallels the information found in Table XXVIII. Experimentees that were taught reading using materials as described in Method I manifested a higher degree of recorded implicit speech and obtained a higher mean comprehension score than those in Method II, however, the difference was not significant at either the .05 or .01 level of confidence.

Table XXXII reveals the data secured while the experimentees read difficult material that was presented non-mechanically.

The recorded implicit speech, as presented in Table XXXII, is essentially the same for Method I and Method II, with Method I being slightly higher. The mean comprehension scores do not parallel that found in Table XXXI as those in Method II manifested a significantly higher mean comprehension score than those in Method I. Based on this data, those experimentees taught to read using an approach which utilized a Basal and Phonics Supplement approach comprehended the difficult material presented non-mechanically more efficiently.

Table XXXII

Mean Incidence of Recorded Implicit Speech and Comprehension Scores for Method I and Method II on Difficult Material Non-Mechanically Presented

	Method I	Method II	N	t
Implicit Speech (Epochs)	43.09	42.40	156	.16
Comprehension	4.47	5.93	152	4.01**

*p $<$.01

Again, comparisons were made between methods in total non-mechanical presentation (easy plus difficult). Table XXXIII shows the mean recorded implicit speech and comprehension scores for the reading of easy and difficult material presented non-mechanically.

Table XXXIII

Mean Incidence of Recorded Implicit Speech and Comprehension Scores for Method I and Method II on Total Non-Mechanical Presentation

	Method I	Method II	N	t
Implicit Speech (Epochs)	86.89	80.87	158	.79
Comprehension	11.64	12.19	158	.97

As shown above, when the total non-mechanical presentation was compared between methods, no significant differences were found. It should be noted, however, that experimentees taught to read through materials of instruction as described in Method I, manifested a higher incidence of recorded implicit speech, but that their mean comprehension score was lower than that shown in Method II.

To answer question three, namely "What is the relationship between selected measures of implicit speech and efficiency of comprehension?" correlations were run between incidences of recorded implicit speech and mean comprehension scores.

Table XXXIV

Correlational Relationship Between Incidence of Recorded Implicit Speech and Comprehension Scores on Selected Reading Activities

(Total Group)

	A	B	C	D	E	F	N
1	.040						209
2		.105					207
3			.132				209
4				-.123			154
5					.068		151
6						.041	158

NOTE: N equals number in population

Key to Variable Code (Tables XXXIV to XXXVI)

Implicit Speech

1. Easy material - presented mechanically
2. Difficult material - presented mechanically
3. Total material - presented mechanically
4. Easy material - presented non-mechanically
5. Difficult material - presented non-mechanically
6. Total material - presented non-mechanically

Comprehension

A. Easy material - presented mechanically

B. Difficult material - presented mechanically

C. Total material - presented mechanically

D. Easy material - presented non-mechanically

E. Difficult material - presented non-mechanically

F. Total material - presented non-mechanically

Table XXXV

Correlational Relationship Between Incidence of Recorded Implicit Speech and Comprehension Scores on Selected Reading Activities

(Achievers)

	A	B	C	D	E	F	N
1	.214						115
2		.036					115
3			.632				115
4				.628			92
5					-.268		89
6						.520	92

Table XXXVI

Correlational Relationship Between Incidence of Recorded Implicit Speech and Comprehension Scores on Selected Reading Activities

(Retardates)

	A	B	C	D	E	F	N
1	-.065						94
2		.143					92
3			.108				94
4				-.217			62
5					-.113		60
6						-.028	68

Table XXXVII

A Ranking of Correlations Between Incidence of Recorded Implicit Speech and Comprehension Scores on Selected Reading Activities

Correlation	Nature of Experimentees	Type of Material	Mode of Presentation
.632	Achievers	Easy & Difficult	Mechanically
.628	Achievers	Easy	Non-mechanically
.520	Achievers	Easy & Difficult	Non-mechanically
.214	Achievers	Easy	Mechanically
.143	Retardates	Difficult	Mechanically
.132	Achievers & Retardates	Easy & Difficult	Mechanically
.108	Retardates	Easy & Difficult	Mechanically
.105	Achievers & Retardates	Difficult	Mechanically
.068	Achievers & Retardates	Difficult	Non-mechanically
.041	Achievers & Retardates	Easy & Difficult	Non-mechanically
.040	Achievers & Retardates	Easy	Mechanically
.036	Achievers	Difficult	Mechanically
-.028	Retardates	Easy & Difficult	Non-mechanically
-.065	Retardates	Easy	Mechanically
-.113	Retardates	Difficult	Non-mechanically
-.123	Achievers & Retardates	Easy	Non-mechanically
-.217	Retardates	Easy	Non-mechanically
-.268	Achievers	Difficult	Non-mechanically

An examination of tables XXXV, XXXVI, and XXXVII reveals that the highest correlational relationship was between recorded implicit speech and comprehension scores for achievers when the material was presented mechanically. Contrasted with this, it is to be noted that a negative correlation was found to exist between recorded implicit speech and comprehension scores on difficult material presented non-mechanically. A more vivid picture could be presented by ranking the correlations from highest to lowest.

As noted in Table XXXV, the four highest correlations between recorded implicit speech and selected reading activities are related to the activities of the achievers. In two instances related to the activities of the achievers the material was presented mechanically, and in two instances the material was presented non-mechanically. It is noted also that in two cases the material presented was operationally defined as easy material; and in the two other instances it was the sum of easy and difficult material.

At the other end of the table, when the negative correlations are considered, the selected reading activities are related to the retardates. When both easy and difficult material was presented non-mechanically to the retardates, a negative relationship between recorded implicit speech and comprehension scores (i.e., as recorded implicit speech decreased, comprehension increased) occurred as illustrated in Table XXXVII.

Correlations were also determined between incidence of recorded implicit speech and scores on selected reading activities when methods of reading instruction were considered. Method I - the instructional materials used in the reading program were the well-known Basal Readers; Method II - the instructional materials employed in the reading program was the Basal Readers with supplementary phonics.

Table XXXVIII shows the relationships in Method I between incidence of recorded implicit speech and comprehension scores on selected reading activities. Table XXXIX shows correlations between the same variables when Method II is considered.

Table XXXVIII

Correlational Relationship Between Incidence of Recorded Implicit Speech and Comprehension Scores on Specified Reading Activities
(Method I)

	A	B	C	D	E	F	N
1	.007						114
2		.058					112
3			.072				114
4				-.202			108
5					.065		105
6						-.065	111

Table XXXIX

Correlational Relationship Between Incidence of Recorded Implicit Speech and Comprehension Scores on Specified Reading Activities
(Method II)

	A	B	C	D	E	F	N
1	-.123						95
2		-.157					95
3			-.158				95
4				.145			[illegible]
5					.085		46
6						.223	47

Key to Variable Code (Tables XXXVIII and XXXIX)

Implicit Speech

1. Easy material - presented mechanically
2. Difficult material - presented mechanically
3. Total material - presented mechanically
4. Easy material - presented non-mechanically

5. Difficult material - presented non-mechanically

6. Total material - presented non-mechanically

Comprehension

A. Easy material - presented mechanically

B. Difficult material - presented mechanically

C. Total material - presented mechanically

D. Easy material - presented non-mechanically

E. Difficult material - presented non-mechanically

F. Total material - presented non-mechanically

An examination of Tables XXXVIII and XXXIX shows that the highest correlation existed between total material (easy plus difficult) non-mechanically presented and total comprehension score (easy plus difficult) when Method II (Basal Readers plus supplementary phonics) had been utilized in the instructional program in reading. Contrasted with the foregoing, it is interesting to note that a negative correlation was found to exist between recorded implicit speech and comprehension scores when easy material was presented non-mechanically. Thus an inverse relationship existed between recorded implicit speech and comprehension scores when easy material was presented non-mechanically to the subjects who had been in a reading program in which the primary instructional materials were Basal Readers. A more vivid picture is presented by ranking the correlations from highest to lowest.

Table XL shows that the three highest correlations between incidence of recorded implicit speech and comprehension scores existed when the reading materials were non-mechanically presented. These correlations existed with the population that was taught by Method II, i.e., instructional materials were the Basal Reader, supplemented with the Phonetic Keys to Reading. At the other end of the scale, with the exception of the last entry, the highest negative correlations existed when the reading material was presented mechanically. These correlations involved the use of easy plus difficult, easy, and difficult reading materials. The three negative correlations involved the use of easy, difficult, and easy plus difficult reading materials. Finally, the highest positive correlation existed with easy plus difficult material presented non-mechanically (Method II), and the highest negative correlation existed with easy plus difficult material presented non-mechanically (Method I).

Table XL

A Ranking of Correlations Between Incidence of Recorded Implicit Speech and Comprehension Scores on Selected Reading Activities

Correlation	Reading Instruction Method	Type of Material	Mode of Presentation
.223	Method II	Easy & Difficult	Non-mechanically
.145	Method II	Easy	Non-mechanically
.085	Method II	Difficult	Non-mechanically
.072	Method I	Easy & Difficult	Mechanically
.065	Method I	Difficult	Non-mechanically
.058	Method I	Difficult	Mechanically
.007	Method I	Easy	Mechanically
-.065	Method I	Easy & Difficult	Non-mechanically
-.123	Method II	Easy	Mechanically
-.157	Method II	Difficult	Mechanically
-.158	Method II	Easy & Difficult	Mechanically
-.292	Method I	Easy & Difficult	Non-mechanically

F. OBJECTIVE 6

To Determine the Relationship Between Methods of Reading Instruction (Basal vs Basal with Supplementary Phonics (Phonetic Keys to Reading) and Recorded Implicit Speech During Silent Reading

Comparisons between children taught by the Basal Approach (referred to as Method I), and children taught by the Basal plus Supplementary Phonics - Phonetic Keys to Reading (referred to as Method II) were made of measured muscle action potential on mechanical and non-mechanical presentation of reading material, defined operationally as easy and difficult.

Table XLI shows that when easy material was presented mechanically on both slow and fast rates of presentation intermediate grade children taught by Method I manifested significantly more recorded implicit speech than did children in Method II under similar circumstances.

Table XLI

Mean Incidence of Recorded Implicit Speech for Method I
and Method II on Easy Material Mechanically Presented
at Slow and Fast Rates
N = 209

	Method I	Method II	t
Slow	149.95	88.08	6.89**
Fast	145.14	75.63	7.91**
Total	295.09	163.72	7.52**
Calibrations (Total)	188.78	180.78	.84

**p .01

It is to be noted that at the first rate of presentation, the experimentees in both Methods I and II, manifested less recorded implicit speech.

Table XLII reveals that much the same relationship existed between recorded implicit speech and methods of instruction when difficult material was presented mechanically at both slow and fast rates.

Table XLII

Mean Incidence of Recorded Implicit Speech for Method I and Method II on Difficult Material Mechanically Presented at Slow and Fast Rates
N = 209

	Method I	Method II	t
Slow	146.52	87.97	5.99**
Fast	142.90	75.76	6.88**
Total	289.42	163.73	6.55**
Calibrations	188.78	180.78	.84

**p .01

On all tests involving the mechanical presentation of material, the Method I experimentees manifested a higher incidence of recorded implicit speech than did the experimentees in Method II. The difference was significant at the .01 level of confidence. It is to be noted that the mean calibrations measures, Tables XLI and XLII were also higher for Method I, but not significant at the .05 level of confidence. Again it should be noted that less recorded implicit speech was manifested at the fast rate of presentation.

On the comparisons between Methods I and II experimentees on the non-mechanical presentation of both easy and difficult reading material, the differences between the means were less pronounced. Table XLIII shows that Method I experimentees manifested a higher incidence of recorded implicit speech when both easy and difficult reading material was presented non-mechanically, but that the differences were not significant at the .05 level.

An examination of Table XLIII shows that experimentees in Method I manifested almost the same recorded implicit speech on both easy and difficult material, while those in Method II manifested a higher incidence of recorded implicit speech while difficult reading material was presented non-mechanically.

Table XLIII

Mean Incidence of Recorded Implicit Speech for Method I and Method II on the Non-Mechanical Presentation of Easy, Difficult Material

	Method I	Method II	N	t
Easy	44.58	38.47	158	1.63
Difficult	43.09	42.40	156	.16
Total	86.89	80.87	158	.79

G. OBJECTIVE 7

To Determine the Relationship Between Recorded Implicit Speech During Silent Reading and Selected Language Processes

The language processes that were related to the incidence of recorded implicit speech and the instruments that were used to measure these processes are as follows:

1. Ability to deal with verbal concepts as measured by The Stanford-Binet Intelligence Scale, Form 1-M, 1960 Edition.

2. General listening ability as measured by The Sequential Tests of Educational Progress (STEP) Listening Test, Form 4A, 1957.

3. Ability to discriminate between sounds in the initial, medial, and terminal positions as measured by the Wepman Auditory Discrimination Test, Form I, 1958.

4. Ability to spell correctly a list of words as measured by the Spache Spelling Test.

5. Ability to read with understanding, accuracy, and at a measured speed, a series of short paragraphs as measured by the Gates Reading Survey Tests, Grades 3-10, Forms 1 and 2, 1958.

6. Ability to perform the four fundamental operations in arithmetic as measured by the American School Achievement Test, Intermediate Battery, Form E, 1955.

7. Skills basic to the ability to attack unknown words independently as measured by the McCullough Word Analysis Test, Experimental Edition, Form I, 1962, which measures the following skills:

    a. Initial Blends and Diagraphs
    b. Phonetic Discrimination
    c. Matching Letters to Vowel Sounds
    d. Sounding Whole Words
    e. Interpreting Phonetic Symbols
    f. Dividing Words into Syllables
    g. Root Words in Affixed Forms
    h. Total Score

8. Oral reading skills as measured by the Gilmore Oral Reading Test, Form A, 1951, which yields the following measures:

    a. Substitutions in which a real, meaningful word is pronounced instead of the word in the text.

    b. Mispronunciations - in which a nonsense word is uttered instead of the word in the text, such as blessful for blissful or maple for maple, or accent on wrong syllable, improper syllabication, etc.

    c. Words pronounced by the examiner or tester - if a five second pause occurs, the tester pronounces the word.

    d. Disregard of punctuation - if the child does not pause for a comma, does not raise voice at end of question, does not let voice fall at the end of a sentence, etc.

    e. Insertions - in which the testee inserts a real word into the text.

    f. Hesitation - if the testee pauses for at least two seconds, and subsequently pronounces the word correctly before five seconds have lapsed.

    g. Repetition - in which the testee repeats the pronunciation of a word, phrase, or groups of words one or more times.

    h. Omissions - in which the testee fails to pronounce a word, a phrase, or a series of words.

For clarity and convenience, data which will reveal the correlations between recorded implicit speech and selected language behaviors will be categorized as follows:

1. Recorded implicit speech and total scores obtained from the administration of the following tests:

    a. Stanford Binet Intelligence Scale

    b. STEP Listening Test

NOTE: All correlations marked with *(.01) or **(.05) are significant from zero (0) according to N (number) at the respective levels of confidence as indicated in Tables XLIV, XLV, and XLVI.

c. Wepman Auditory Discrimination Test

d. Spache Spelling Test

e. Gates Survey Reading Test

f. American School Achievement Test, Intermediate Battery

g. The Separate Parts of the McCullough Analysis Test, Form 1, Experimental Edition

h. The Separate Parts of the Gilmore Oral Reading Test, Form A

Table XLIV reveals the correlations between the incidence of recorded implicit speech and the total scores obtained as a result of the administration of the tests listed. A cursory glance at the table reveals that there is an inverse relationship between, and to a significant degree, recorded implicit speech and auditory discrimination. With the exception of difficult reading material presented at slow, fast, and slow-plus-fast rate, there is a significant negative correlation between incidence of recorded implicit speech and the total number of words spelled correctly as determined by the Spache Spelling test.

The Wepman Auditory Discrimination Test measures the ability of the testee to discriminate sounds in the initial, medial and terminal positions in words. The fact that there is a significant negative correlation between the two variables, incidence of recorded implicit speech and the number of words in which appropriate discriminations were made, indicates that as the first variable increases the second decreases, and as the second increases the first decreases. On the basis of these data vocalism or implicit speech is not related to the ability to discriminate sounds in the three positions of words as noted.

When the reading material was presented mechanically, negative correlations were obtained between recorded implicit speech and the STEP Listening Test and the two Gates Reading Survey Tests. These correlations were not significant at either the .05 or .01 level of confidence.

Different correlations were obtained when the material was presented non-mechanically. Significant negative correlations were obtained between the incidence of recorded implicit speech and the Binet score, the STEP Listening Test, the Wepman Auditory Discrimination Test, the Spache Spelling Test, and the two Gates Tests.

Table XLIV

Correlational Relationship Between Recorded Implicit Speech and Scores Obtained from the Administration of Selected Standardized Tests

	Mode of Presentation	N	Binet	N	STEP Listening	N	Wepman	N	Spache	N	Gates I	N	Gates II	N	Amer. School Achieve.
Easy Material (Slow)	Mechanical	206	.072	173	-.000	199	-.216*	197	-.178**	197	-.102	198	-.041	208	.049
Easy Material (Fast)	Mechanical	206	.078	173	.003	199	-.278*	197	-.181**	197	-.064	198	-.025	208	.028
Easy Material (Total)	Mechanical	206	.076	173	.001	199	-.250*	197	-.182**	197	-.084	198	-.034	208	.039
Difficult Material (Slow)	Mechanical	206	.010	173	-.069	199	-.191**	197	-.111	197	-.125	198	-.074	208	.006
Difficult Material (Fast)	Mechanical	206	.030	173	-.024	199	-.259*	197	-.130	197	-.108	198	-.058	208	-.000
Difficult Material (Total)	Mechanical	206	.021	173	-.047	199	-.228*	197	-.123	197	-.118	198	-.067	208	.003
Total (Slow)	Mechanical	206	.042	173	-.032	199	-.209*	197	-.148**	197	-.114	198	-.058	208	.025
Total (Fast)	Mechanical	206	.055	172	-.015	198	-.275*	196	-.160**	196	-.092	197	-.045	207	.016
Total	Mechanical	206	.049	173	-.024	199	-.245*	197	-.156**	197	-.104	198	-.052	208	.021
Easy Material	Non-Mechanical	156	-.150	144	-.255*	152	-.256*	147	-.205**	147	-.239*	149	-.243*	158	-.134
Difficult Material	Non-Mechanical	154	-.160**	142	-.178**	150	-.265*	145	-.188**	145	-.228*	147	-.181**	156	-.033
Total	Non-Mechanical	156	-.166**	144	-.237*	152	-.257*	147	-.209**	147	-.249*	149	-.220*	158	-.083

*p .01 **p .05

A low negative correlation between the primary variable and the American School Achievement Test, when the reading material was presented non-mechanically is of no particular significance.

Table XLV shows the correlations between the primary variable, incidence of recorded implicit speech, and the results of the separate parts of the McCullough Word Analysis Test. This test is one of the few which provides a measure of a group of children's ability to unlock the pronunciation of words independently. Specifically, it measures selected readiness aspects of independence in word recognition.

An examination of the table shows that, with the exception of root words in affixed forms, negative correlations were obtained between the primary variable, incidence of recorded implicit speech, and the scores obtained from the administration of the several subsections of the test.

Significant negative correlations were obtained between the primary variable when the reading material was presented non-mechanically, and the scores of the following subtests:

1. Initial Blends and Diagraphs

2. Phonetic Discrimination

3. Matching Letters to Sounds

4. Sounding Words

5. Interpretation of Phonetic Symbols

6. Syllabication

Since this negative relationship exists, it simply means that as the primary variable increases, the six variables listed above decrease. Also, as the primary variable decreases, the six variables increase to a significant degree, particularly if the reading material was presented to the experimentees non-mechanically.

When the reading material was presented mechanically, significant negative correlation were obtained between the incidence of recorded implicit speech and the scores obtained from the following subtests:

1. Initial Blends and Diagraphs

2. Phonetic Discrimination

3. Matching Letters and Sounds

Table XIV

Correlational Relationship Between Incidence of Recorded Implicit Speech and Scores Obtained from the Administration of the McCullough Word Analysis Test

	Mode of Presentation	N	Total Score	N	Initial Blend-Diag.	N	Phonetic Discrim.	N	Matching Letters to Sounds	N	Sounding Words	N	Interpret Ph. Symb.	N	Syllabication	N	Root Words - Affixed Forms
Easy Material (Slow)	Mechanical	199	-.045	199	-.149**	199	-.143**	198	-.167**	136	-.072	136	-.079	199	-.118	135	.015
Easy Material (Fast)	Mechanical	199	-.015	199	-.150**	199	-.162**	198	-.153**	136	-.086	136	-.089	199	-.090	135	.018
Easy Material (Total)	Mechanical	199	-.030	199	-.151**	199	-.155**	198	-.162**	136	-.080	136	-.085	199	-.106	135	.017
Difficult Material (Slow)	Mechanical	199	-.117	199	-.237*	199	-.198*	198	-.219*	136	-.106	136	-.104	199	-.110	135	.034
Difficult Material (Fast)	Mechanical	199	-.082	199	-.179**	199	-.212*	198	-.196*	136	-.125	136	-.112	199	-.110	135	.031
Difficult Material (Total)	Mechanical	199	-.101	199	-.211*	199	-.209*	198	-.211*	136	-.117	136	-.109	199	-.112	135	.033
Total (Slow)	Mechanical	199	-.086	199	-.201*	199	-.175**	198	-.194*	136	-.096	136	-.090	199	-.114	135	.024
Total (Fast)	Mechanical	198	-.049	198	-.169**	198	-.196*	197	-.185**	135	-.104	135	-.106	198	-.109	134	.027
Total	Mechanical	199	-.068	199	-.187**	199	-.187**	198	-.192*	136	-.101	136	-.099	199	-.112	135	.026
Easy Material	Non-Mechanical	149	-.345*	149	-.321*	149	-.462*	148	-.205**	117	-.289*	117	-.318*	149	-.172**	116	-.147
Difficult Material	Non-Mechanical	147	-.298*	147	-.177**	147	-.410*	146	-.231*	115	-.285*	115	-.325*	147	-.160	114	-.124
Total	Non-Mechanical	149	-.341*	149	-.259**	149	-.456*	148	-.284*	117	-.303*	117	-.344*	149	-.183**	116	-.139

*p .01 **p .05

It is to be noted that significant negative correlations were obtained between the primary variable and the three subsections of the test listed above. Whether the reading material was presented mechanically or non-mechanically, there was an inverse relationship between the primary variable and the scores on the three subtests mentioned above. Therefore, as recorded implicit speech increases there was a decrease in the ability of the experimentees to identify initial blends and diagraphs, make phonetic discriminations, and to match letters to sounds.

An examination of Table XLVI yields some relationships which while not statistically significant, do provide some insight into the errors the students made during oral reading that are related in some way to implicit speech.

Table XLVI

Correlational Relationship Between Incidence of Recorded Implicit Speech and Scores Obtained from the Administration of the Gilmore Oral Reading Test

	Mode of Presentation	N	Substitutions	N	Mispronounced	N	Words Pron.	N	Disregard Punct.	N	Insertions	N	Hesitations	N	Repetitions	N	Omissions
Easy Material (Slow)	Mechanical	207	-.120	207	.030	207	.056	207	.013	207	.093	206	-.056	207	-.122	205	.143
Easy Material (Fast)	Mechanical	207	-.096	207	.044	207	.066	207	-.030	207	.063	206	-.073	207	-.136	205	.108
Easy Material (Total)	Mechanical	207	-.109	207	.038	207	.062	207	-.008	207	.079	206	-.065	207	-.131	205	.127
Difficult Material (Slow)	Mechanical	207	-.089	207	-.020	207	.086	207	.027	207	.123	206	-.031	207	-.124	205	.101
Difficult Material (Fast)	Mechanical	207	-.123	207	.008	207	.097	207	.019	207	.086	206	-.045	207	-.112	205	.113
Difficult Material (Total)	Mechanical	207	-.108	207	-.006	207	.093	207	.023	207	.106	206	-.039	207	-.120	205	.109
Total (Slow)	Mechanical	207	-.102	207	.005	207	.074	207	.022	207	.112	206	-.045	207	-.130	205	.125
Total (Fast	Mechanical	206	-.119	206	.025	206	.084	206	-.005	206	.077	205	-.060	206	-.125	204	.114
Total	Mechanical	207	-.111	207	.015	207	.080	207	.008	207	.095	206	-.053	207	-.128	205	.121
Easy Material	Non-Mechanical	156	-.014	156	.000	156	.137	156	.012	156	-.035	155	-.077	156	-.010	155	.084
Difficult Material	Non-Mechanical	154	.015	154	.021	154	.160	154	-.087	154	.086	153	-.120	154	-.021	153	.040
Total	Non-Mechanical	156	.029	156	-.010	156	.163	156	-.031	156	.021	155	-.177	156	-.003	155	.062

NOTE: None of the correlations are significant at either the .01 or .05 level

V. Conclusions

The conclusions of this study will be expressed and related to their specific objectives. These will be listed under Specific Conclusions. Broad generalizations will be based upon a further categorization of the separate findings and will be listed under General Conclusions. A third part will be a discussion of some of the findings, including implications and recommendations.

A. Specific Conclusions

1. The first objective, which was general in nature, was to determine the incidence of recorded implicit speech among a selected group of intermediate grade children. To answer Objective No. 1 it was necessary to secure answers to the following subquestions:

    1. Is there a significant difference in the amount of recorded implicit speech during a reading and a non-reading activity?

    2. Is there a significant difference in the amount of recorded implicit speech during the mechanical presentation of easy and difficult reading material?

    3. Is there a significant difference in the amount of recorded implicit speech during the presentation of material at a slow and fast rate?

    Based on the data collected, the following specific conclusions may be drawn:

    a. There was more recorded implicit speech during a reading activity than during a non-reading activity. The difference was significant at the .01 level of confidence.

    b. More recorded implicit speech was manifested during the reading of easy material presented mechanically. The difference was not significant at the .05 level of confidence.

    c. There was more recorded implicit speech while reading at a slow rate than at a fast rate. The differences were significant at the .01 level of confidence.

2. The second objective was to determine which of two groups of children, the reading achievers or the reading retardates, manifested a higher incidence of recorded implicit speech during silent reading. To answer Objective No. 2 it was necessary to find answers to the following subquestions:

a. Do the reading achievers or the reading retardates manifest a higher incidence of recorded implicit speech during the mechanical presentation of reading material?

b. Do the reading achievers or the reading retardates manifest a higher incidence of recorded implicit speech during the non-mechanical presentation of reading material?

Based on the data collected, the following specific conclusions may be drawn:

a. The retardates in each instance manifested more recorded implicit speech while the reading material was presented mechanically.

b. Retardates manifested more recorded implicit speech while the material was presented non-mechanically; this was observed while the testees read both easy and difficult material.

3. The third objective was to determine the relationship, if any, between the incidence of recorded implicit speech during silent reading and the rate of presentation of material. As noted previously, the experimentees read both easy and difficult material. Both selections were presented mechanically, and the rate of presentation was increased every thirty seconds. Based on the data collected it can be concluded:

   a. There was a decrement of recorded implicit speech as the rate of presentation was increased. This conclusion applied to both retardates and achievers while reading operationally defined easy and difficult material.

4. The fourth objective was to determine, if possible, a rate of presentation at which there would be a minimal manifestation of recorded implicit speech. No definitive answer to this question was obtained. However, an examination of Tables XIX, XX and XXI and Graphs No. 1, 2 and 3 reveals that:

   a. There was a sharp decrement in mean recorded implicit speech from a mean rate of 88 words/minute to 107 words/minute, but that subsequent decrements were not nearly as marked.

5. The fifth objective was to determine the relationship between incidence of recorded implicit speech during silent reading and efficiency of comprehension. To answer the fifth objective it was deemed necessary to secure answers to the following sub-questions, namely:

a. What is the relationship between mean incidence of recorded implicit speech and efficiency of comprehension?

b. What is the relationship between mean incidence of recorded implicit speech and efficiency of comprehension when comparisons are made between two methods of reading instruction, i.e., Basal and Basal with supplementary Phonics?

c. What is the relationship between selected measures of recorded implicit speech and efficiency of comprehension?

Several findings can be related to questions "a" above. Tables XX-XXV inclusive reveal the following information:

a. When easy material was presented mechanically, the retardates manifested more recorded implicit speech, and made a higher score on the comprehension test; both differences were significant at the .05 level of confidence.

b. When difficult material was presented mechanically, the retardates manifested more recorded implicit speech, but the achievers scored higher on comprehension. The differences, however, were not significant at the .05 level of confidence.

c. When easy material was presented non-mechanically, the retardates manifested more recorded implicit speech, but the achievers obtained a higher score on comprehension. Neither difference was significant at the .05 level of confidence.

d. When difficult material was presented non-mechanically again the retardates manifested a higher incidence of recorded implicit speech, but the achievers scored higher on comprehension; the differences, however, were not significant at the .05 level of confidence.

Several findings can also be related to question "b" above. Tables XXVI-XXXI, inclusive, reveal the following information:

a. When easy material was presented mechanically testees in Method I (Scott Foresman Basal Series) manifested more implicit speech and secured higher scores on the comprehension test. Both scores were significant at the .01 level of confidence.

b. When difficult material was presented non-mechanically the Method I testee's manifested more recorded implicit speech and, also, scored higher on the comprehension test than the testees in Method II. In both incidences, the difference favored Method I, and were significant at the .01 level of confidence.

c. On total mechanical presentation, easy plus difficult, those students in Method I manifested more recorded implicit speech and scored higher on the comprehension test. Both were significant at the .01 level of confidence.

d. When easy material was presented non-mechanically testee's in Method I manifested more recorded implicit speech and scored higher on the comprehension test. Neither score was significant at the .05 level of confidence.

e. When difficult material was presented non-mechanically, those testee's in Method I manifested more recorded implicit speech, but those in Method II scored higher on the comprehension test. In the latter case, the difference was significant at the .01 level of confidence.

f. When both easy and difficult material were presented non-mechanically, those in Method I manifested more recorded implicit speech, but those in Method II scored higher on the comprehension test. In neither instance was the difference significant at the .05 level of confidence.

Again, several findings can be related to question "c" above. Tables XXXII-XXXVIII reveal the following information:

a. When material was mechanically presented, the highest correlation was obtained between recorded implicit speech and comprehension scores of the achievers on both easy and difficult material.

b. When the material was non-mechanically presented, the highest negative correlation was found between recorded implicit speech and comprehension scores for the achievers on difficult material.

c. When methods of reading instruction were considered, the highest positive correlation existed when total material (easy plus difficult) was presented non-mechanically when Method II was employed in the reading program. Contrasted with the foregoing, the highest negative correlation was found to exist when easy material was presented non-mechanically (Method I).

d. The three highest positive correlations (Method II) existed between incidence of recorded implicit speech and comprehension scores when both easy and difficult material was presented non-mechanically.

e. The highest negative correlation (Method I) existed when total material (easy plus difficult) was presented non-mechanically.

6. The sixth objective was to determine the relationship between methods of Reading Instruction (Basal vs. Basal with Supplementary Phonics - Phonetic Keys to Reading) and vocalism during silent reading.

In order to answer this question, comparisons were made between incidence of recorded implicit speech between children taught by the Basal Approach (Method I) and children taught by Basal plus supplementary phonics (Method II) when the reading material was presented mechanically and non-mechanically. Based on the findings, the following specific conclusions may be drawn:

a. When easy material was presented mechanically at both slow and fast rates, the children in Method I manifested a higher incidence of recorded implicit speech than those in Method II. The difference was significant at the .01 level of confidence.

b. When difficult material was presented mechanically at both slow and fast rates, the children in Method I manifested a higher incidence of recorded implicit speech than those in Method II. The difference was significant at the .01 level of confidence.

c. When easy and difficult material were presented non-mechanically, the children in Method I manifested a higher incidence of recorded implicit speech than those in Method II. The differences were slight and not significant at the .05 level of confidence.

7. The seventh objective was to determine the relationship between recorded implicit speech during silent reading and selected language processes as measured by the following instruments:

a. The Stanford-Binet Intelligence Scale, Form L-M, 1960 Edition

b. Sequential Tests of Educational Progress (STEP) Listening Test, Form 4A, 1957.

c. Wepman Auditory Discrimination Test

d. Spache Spelling Test

e. Gates Survey Reading Test, Form I

f. Gates Survey Reading Test, Form II

g. American School Achievement Test, Intermediate Battery

h. The Separate Parts of the McCullough Word Analysis Test, Form I, Experimental Edition.

i. The Separate Parts of the Gilmore Oral Reading Tests.

Based on the data collected, the following specific conclusions may be drawn:

a. When the material was presented mechanically, the correlation (r) between incidence of recorded implicit speech, and

  1) Mental age as determined by the Binet Intelligence Scale was positive and low, and not significant,

  2) The total score of the STEP listening test was negative when students read difficult material, and not significant,

  3) The number of words correctly discriminated on the Wepman Auditory Discrimination Test was negative and significant at either the .05 and .01 level of confidence,

  4) The total number of words spelled correctly on the Spache Spelling Test was negative and significant at the .01 level of confidence when easy material was read at slow, fast, and total rates,

  5) The total score on both the Gates Survey Tests was negative, but not significant at the .05 level of confidence,

  6) The score on the Arithmetic Computation part of the American School Achievement Test was positive and low, and not significant at the .05 level of confidence.

b. When the material was presented non-mechanically, the correlation (r) between incidence of recorded implicit speech, and:

  1) Mental age as determined by the Binet Intelligence Scale was negative and significant when the students read difficult material,

2) The total score of the STEP Listening Test was negative and significant at the .05 level of confidence

3) The number of words correctly discriminated on the Wepman Auditory Discrimination Test, was negative and significant at the .05 level of confidence

4) The total number of words spelled correctly on the Spache Spelling Test was negative and significant at the .01 level of confidence

5) The total score on both of the Gates Survey Tests was negative and was significant at the .05 level of confidence

6) The score on the Arithmetic Computation part of the American School Achievement Test was negative and not significant at the .05 level of confidence.

c. When the reading material was presented either mechanically or non-mechanically, the correlation between the incidence of recorded implicit speech and the separate parts of the McCullough-Word Analysis Test were:

1) Initial Blends and Diagraphs, Phonetic Discrimination, and Matching Letters to Sounds, were negative and significant at the .05 level of confidence

2) Sounding Words, Interpreting Phonetic Symbols and Syllabication were negative and not significant at the .05 level of confidence

3) Root Words - Affixed Forms was positive and not significant, except when the material was presented non-mechanically. In the latter case it was negative and not significant

4) The total score was negative and only significant when the reading material was presented non-mechanically

d. When the material was presented either mechanically or non-mechanically, the correlation between the incidence of recorded implicit speech and the separate parts of the Gilmore Oral Reading Test were as follows:

1) Substitutions, Hesitations, and Repetitions were negative and low and not significant at the .05 level of confidence.

2) Words Mispronounced, Words Pronounced by Examiner, Disregard of Punctuation, Insertions, and Omissions were low. Some of the correlations were negative - a greater number were positive and none were significant at the .05 level of confidence.

B. General Conclusions

Based upon the data collected and subjected to the limitations imposed by all facets of the standard operating procedure, the following conclusions are drawn from the study: that implicit speech is a natural adjunct of the silent reading process; that it is manifested in varying degrees; and furthermore that attempts to inhibit it should be discontinued. Three implications may be drawn from the study: first, that implicit speech in silent reading may be an integral part of learned oral language patterns; second, that it may be a reinforcing mechanism or an added sensory input into cortical functioning; and third, that, possibly, the most efficient manner by which a decrement in its manifestation can be effected is to provide and manipulate a learning environment that ensures growth towards maturity in language skills. To support the above, the following are given:

1. It was determined that more recorded implicit speech was manifested during a reading activity than during a non-reading activity. The differences were significant at the .01 level of confidence. It is to be noted also that more recorded implicit speech was manifested during the silent reading of operationally defined easy reading material than during the silent reading of operationally defined difficult material; however, the difference was not significant at the .05 level of confidence. There was more recorded implicit speech while reading at an operationally defined fast rate. The differences were significant at the .01 level of confidence.

2. When comparisons were made between two groups of children, one group which was defined as retardates, and the other group which was defined as achievers, it was found that in each instance, i.e., on easy and difficult material, fast and slow rates, mechanically presented and non-mechanically presented, the retardates manifested more recorded implicit speech. It is interesting to note that both achievers and retardates manifested more recorded implicit speech during the reading of easy material presented mechanically. In contrast to this, when the reading material was non-mechanically presented, both achievers and retardates manifested more recorded implicit speech when reading difficult material. (The former is in opposition to that found by Edfelt (12). It must be borne in mind, however, that he used mature medical students as his experimentees.)

3. It was noted as the rate of mechanical presentation was increased, there was a decrement in recorded implicit speech. This finding applied to both retardates and achievers while reading easy and

difficult material. Based on the data collected, there is an inverse relationship between the incidence of recorded implicit speech and the rate at which the material was presented mechanically.

4. The above conclusion, i.e., that there was an inverse relationship between recorded implicit speech and the mechanical rate of presentation of silent reading material, did not indicate, however, if there was a rate of presentation at which there would be minimal manifestation of recorded implicit speech. A rough measure of this was derived from the data collected. A sharp decrement in recorded implicit speech was noted as the mechanical rate of presentation increased from approximately 88 words/minute to 107 words/minute. From approximately 107 words/minute to approximately 182 words/minute there was some decrement in recorded implicit speech. However, from this latter rate to the limit of the machine, approximately 200 words/minute, there was little decrement in recorded implicit speech. Based on the data collected, it can be assumed with a fair degree of confidence that there will be minimal recorded implicit speech when intermediate grade students read in excess of 180 words per minute.

5. The question of the relationship between incidence of recorded implicit speech and the efficiency of comprehension has been foremost in the minds of scholars who have studied the phenomena of vocalism in silent reading. The data collected in this study gave valuable clues or insights into some possible answers. The mechanical presentation of easy material influenced reading behavior. In fact, the retardates manifested more recorded implicit speech and made higher scores on the comprehension test than did the achievers. When difficult material was presented mechanically an inverse relationship existed between recorded implicit speech and efficiency of comprehension. An inference that may be drawn is that the less efficient reader makes maximum use of the added sensory input of vocalism to comprehend easy material. This added input was of little avail when retardates were reading operationally defined difficult material.

6. Another question raised by scholars concerning implicit speech is the relationship between it and reading methodology. Comparisons were made between groups of students taught by different methods of reading instruction to determine the influence of methodology on implicit speech. On total mechanical presentation, intermediate grade children taught by a basal series (Method I) manifested more recorded implicit speech and scored higher on the comprehension test than did those students taught by the basal series augmented by supplementary phonics, (Method II). When the reading material

was presented non-mechanically, students taught by Method I manifested more recorded implicit speech, but those in Method II scored higher on the comprehension test.

7. The question concerning the influence of phonics in beginning reading instruction on implicit speech was viewed as an important element of the study. This question, and ones related to it, have been asked many times by scholars. The data gathered from this study would suggest that augmenting a basal program by the use of a supplementary phonics program did not influence recorded implicit speech. Specifically, comparisons were made between intermediate grade children taught by the Basal Approach (Method I) and children taught by Basal Reader Method supplemented by phonics, (Method II). When both easy and difficult material were presented at both slow and fast rates (mechanical presentation), the children in Method I manifested a higher incidence of recorded implicit speech. When the reading material was presented non-mechanically (children read at their most comfortable speed), the children in Method I manifested more recorded implicit speech, but the difference was not significant at the .05 level of confidence. Thus, based on the data collected and subject to the limitations imposed by the standard operating procedure, augmenting a Basal Program with a commercially produced phonics program did not induce more vocalism during silent reading.

8. The relationship between recorded implicit speech and selected language processes, if any, would be of interest to scholars in the area of language. Are these relationships negative or positive, and to what degree, is a question of interest, not only to students of language, but to all who are entrusted with the education of the nation's students. While it is impossible to draw overall conclusions concerning the relationship between recorded implicit speech and the selected language process, abstracting relevant data from some of the language process give rise to the following conclusion:

    a. The manner in which the reading material was presented to the experimentee influenced the correlation between recorded implicit speech and mental age as determined by the Stanford Binet Intelligence Scale. When the material was presented mechanically, there was a rather low positive correlation between recorded implicit speech and intelligence. The correlation ranged from a low of .01 to a higher of .076 (See Table XLIV). When the material was presented non-mechanically.

there was a negative relationship between recorded implicit speech and intelligence. The correlations ranged from a low of -.150 to a high of -.166 (See Table XLIV).

b. Regardless of the mode of presentation, the correlation between recorded implicit speech and total score on the STEP Listening Test was negative. Thus an inverse relationship existed between the two variables. The better listener manifested less recorded implicit speech. This parallels the relationship between reading achievers and recorded implicit speech. Thus, the impressive aspects of language, namely, reading and listening, correlate negatively with recorded implicit speech.

c. Again, and regardless of the mode of presentation, the number of words correctly discriminated on the Wepman Auditory Discrimination Test was negative and significant at the .01 level of confidence. Thus an inverse relationship existed between recorded implicit speech and ability to discriminate words which may or may not sound alike. Based on the evidence collected, it can be implied that inner vocalization or implicit speech did not enhance the ability to discriminate sounds.

d. The manner of presentation of the reading material did influence the correlation that existed between the number of words spelled correctly and the incidence of recorded implicit speech. When the reading material was presented (mechanically or non-mechanically) the correlation between the number of words spelled correctly and the incidence of recorded implicit speech was negative and significant at the .01 level of confidence. Thus, an inverse relationship existed between spelling ability and incidence of recorded implicit speech. As with the results of the Wepman Auditory Discrimination Test, implicit speech did not enhance the ability to spell correctly the words on the Spache Spelling Test.

e. Apparently, the mode of representation of the silent reading material had no effect on the correlation that existed between total score on the Gates Reading Survey Test and the incidence of recorded implicit speech. When presented either mechanically or non-mechanically, the correlation between the two variables was negative but not significant.

f. Again, as in d and e above, the mode of presentation of the material read silently had no effect on the correlations that existed between the score on the arithmetic computation part of the American School Achievement Test and the incidence of recorded implicit speech. In either mode of presentation, the correlations were negative and not significant.

g. The correlation that existed between scores on certain parts of the McCullough Word Analysis Test and the incidence of recorded implicit speech was influenced little by the mode of presentation of the silent reading material. Scores on initial Blends and Diagraphs, Phonetic Discrimination and Matching Letters to Sounds, correlated significantly with the incidence of recorded implicit speech. Since the correlation was negative, an inverse relationship existed between incidence of recorded implicit speech and the ability to identify Initial Blends and Diagraphs, discriminating between Phonetic Symbols, and the ability to Match Letters with Sounds. Thus the phenomena of inner speech or implicit speech did not enhance the ability to perform the language processes listed above. The ability to sound words, interpret phonetic symbols, and divide words into syllables correlated negatively with the incidence of recorded implicit speech. The relationship, however, was not significant at the .05 level of confidence. The correlation between Root Words - Affixed Forms and the incidence of recorded implicit speech was positive and not significant, except when the reading material was presented non-mechanically. In the latter case it was negative and not significant at the .05 level of confidence. The total score was negative and significant only when the reading material was presented non-mechanically. Thus the mode of presentation of the silent reading material influenced the correlation that existed between the two variables for the total score, Root Words, and Affixed Forms. In all other cases, the mode of presentation had little or no effect.

h. Evidently, the mode of presentation of the material read silently had little effect on the correlations that existed between scores obtained on the types of errors made while reading orally and the incidence of recorded implicit speech. On Substitutions, Hesitations, and Repetitions as measured by the Gilmore Oral Reading Test, the correlations were negative and not significant. The correlations between Words Mispronounced, Words Pronounced by Examiner, Disregard of Punctuation, Insertions and Omissions and the incidence of recorded implicit speech were low and not significant. Some correlations were positive and others were negative with the greater number being positive.

C. Discussion, Implications, and Some Recommendations

As stated in the general conclusions, implicit speech or inner speech is a natural adjunct of the silent reading process and measures to inhibit its manifestation should be discontinued. Based on the data collected and the observation of the experimentees and subject to the limitations imposed by operating procedure and the materials, tests, and equipment used, the following inferences may be drawn:

> The evidence in this study indicates that there was more recorded implicit speech manifested during a reading activity than during a non-reading activity by all the readers involved in the study. Also, it seems apparent from the results of the study that as readers become more proficient, they depend less on implicit speech as a type of verbal reinforcer. However, there is evidence also, that readers utilize implicit speech as a reinforcer functionally, i.e., the reader employs implicit speech to reinforce or recognize words more when the material is familiar (easy) than when it is not familiar (difficult). The evidence indicates also, that implicit speech is controlled or influenced by the mode and rate of presentation of the reading material. At slower rates of mechanical presentation there was a higher incidence of implicit speech than at faster rates of presentation. It appeared from observing the subjects during experimental protocol that the mechanical presentation of reading material stimulated lip movement behavior. It was observed also that the lip-movement behavior increased during the mechanical presentation until the point at which the subjects could no longer keep pace with the rate at which the modified Metronoscope presented the silent reading material.
>
> There was significantly more recorded implicit speech during the reading of easy material, mechanically presented at both slow and fast rates, than during the reading of difficult material. This conclusion is contrary to that found by Edfelt (12). It is difficult to rationalize this phenomena. It could be assumed that more implicit speech was involved because both achievers and retardates made high comprehension scores on the easy material. Since implicit speech is a secondary reinforcing activity or another sensory input in cortical functioning (comprehension), evidently more cortical activity was present during the reading of the easy material. There was more recorded implicit speech manifested while reading at a slow rate. This conclusion is consonant with what other writers have found. Again, the implication is that while reading slowly the speech patterns parallel more closely oral language patterns, but the greater differential between silent reading rate and the normal oral rate will be accompanied by diminution in implicit speech.

The retardates in each instance manifested more recorded implicit speech than did the achievers. This was true when reading at both a slow rate and at a fast rate, and for both easy and difficult material. It must be postulated that since achievers manifest higher achievement levels and higher comprehension skills and less implicit speech, the retardates appear to be more reliant on this added sensory input during silent reading without substantial returns on the additional input. Furthermore, it is postulated that this manifestation of recorded implicit speech is evidence of a residue of initially learned oral language patterns. Evidently, with growth towards maturity in language skills, there is a natural decrement in recorded implicit speech. It is noted that the experimentees who were higher achievers in listening and reading manifested less recorded implicit speech.

There was a decrement of recorded implicit speech as the mechanical rate of presentation was increased; this conclusion was applicable to both achievers and retardates while reading both operationally defined easy and difficult material. As the differential between the silent reading rate and the normal oral reading rate increased, less implicit speech was manifested. This would appear to be logical, since it is apparent that there is a point at which the organs of speech can no longer articulate the sounds. At high rates of silent reading, the attempted articulation would be sketchy and partial. There was a sharp decrement in mean recorded implicit speech from a mean rate of approximately 88 words/minute (minimal rate) to approximately 107 words/minute. There was less decrement as the rate approached approximately 180 words/minute. As the rate increased beyond this point, practically no decrement in recorded implicit speech was observable. It was impossible to identify a rate of mechanical presentation at which there would be minimal recorded implicit speech. It would be logical to assume that increasing a child's silent reading rate beyond his normal rate would be futile if the primary objective was to cause a marked decrement in recorded implicit speech.

There appears to be a relationship between manifestation of recorded implicit speech and efficiency of comprehension. Attention of the reader is directed toward the following:

1. With the mechanical presentation of easy material, the retardates exhibited more recorded implicit speech and scored higher on the comprehension questions than did the achievers.

2. With the mechanical presentation of difficult material, the retardates again manifested more recorded implicit speech but the achievers scored higher on comprehension. It is most difficult to rationalize the fact that the retardates, while manifesting more recorded implicit speech, also made high comprehension

scores than did the achievers on easy material mechanically presented. A first implication is that since the retardates exhibited more implicit speech, a higher degree of secondary reinforcement occurred, and also, that an additional input (implicit speech) went into cortical functioning, resulting in better comprehension. A second implication is that the easy material was not challenging enough for the achievers, and therefore, the attitude towards the reading act was not one which lends itself towards appropriate comprehension.

And furthermore, it is to be noted that on difficult material, while the retardates exhibited more recorded implicit speech, they did not comprehend the material as well as the achievers. Evidently, the achievers relied less on this added sensory input nevertheless comprehended better than the retardates. Perhaps the difficult material was beyond the ability of the retardates to understand it.

It is to be noted that when easy material was presented non-mechanically, the achievers manifested less implicit speech and scored higher on the comprehension questions. It might be postulated that the mechanical presentation of reading material was an inhibitory factor in comprehension. (A question must be asked, "Did the machine, the junior model metronoscope, claim the attention of the reader, rather than the reading material itself?")

Contrary to the belief held by some scholars, the data obtained in this study supported a conclusion that the over-emphasis on phonics in a beginning program or augmenting a basal reading program with supplementary phonics would result in increased manifestation in recorded implicit speech. In fact, the experimentees taught by the basal program during grades 1-3 manifested significantly more recorded implicit speech. This was true for both easy and difficult material mechanically presented at both slow and fast rates. When both easy and difficult reading material was presented non-mechanically the children using the basal series during grades 1-3 manifested more recorded implicit speech.

Evidently, an intensified phonics program does not induce more implicit speech. On the mechanical presentation of reading material, those students exhibiting more recorded implicit speech also scored higher on the comprehension test; however, when the reading material was presented non-mechanically, students taught by the basal series manifested more recorded implicit speech, but those taught by basal augmented by an intensified phonics program exhibited less recorded implicit speech but scored higher on the comprehension test.

The non-mechanical presentation of reading material is a more natural reading situation, and therefore, would have implications for any reading program. Evidently, the additional phonics resulted in less recorded implicit speech and higher comprehension scores.

The mode of presentation of the material read silently had an effect upon the manifestation of recorded implicit speech:

1. When easy material was presented mechanically, the retardates manifested more recorded implicit speech and scored higher on the comprehension test. When difficult material was presented mechanically, the retardates manifested more recorded implicit speech but the achievers scored higher on the comprehension test. In contrast to the above, when easy material was presented non-mechanically, the retardates manifested more implicit speech but the achievers scored higher on the comprehension test. It could be inferred that the mechanical presentation aided the retardates when easy reading material was presented.

2. When both easy and difficult material was presented mechanically, those students in the basal program manifested more recorded implicit speech and scored higher on the comprehension test. When easy material was presented non-mechanically, students in the basal program manifested more recorded implicit speech and scored higher on the comprehension test. But when difficult material was presented non-mechanically, students in the basal program manifested more recorded implicit speech; however, students in the basal plus supplementary phonics scored higher on the comprehension test. As in a above, evidently the mechanical presentation of easy material enhanced the students ability to comprehend the material.

3. The three highest positive correlations (students in basal program plus supplementary phonics) existed between incidence of recorded implicit speech and comprehension scores when both easy and difficult material was presented non-mechanically. The highest negative correlation (students in basal program) existed when total material (easy plus difficult) was presented non-mechanically. Evidently, the critical element was not mode of presentation, but rather methodology of reading instruction.

4. On several of the language processes, as measured by selected standardized tests, the mode of presentation of the material read silently, was the critical element. Correlations between incidence of recorded implicit speech, when the material was presented mechanically and then non-mechanically:

a. STEP Listening went from negative (N.S.) to negative and significant

b. The total score on both the Gates Reading Survey Tests went from negative (N.S.) to negative and significant

c. The score on the Arithmetic Computation part of the American School Achievement went from positive and low to negative and not significant.

d. The total score on the McCullough Word Analysis Test went from negative (N.S.) to negative and significant at the .05 level of confidence.

On other language processes as measured by the Standardized Tests, the mode of presentation of the material that was read silently was not the critical element. In other words, whether the reading material was presented mechanically or non-mechanically, significant correlations were secured in either case between incidence of recorded implicit speech and the following measures:

1. The number of words correctly discriminated on the Wepman Auditory Discrimination Test was negative and significant at the .05 level of confidence.

2. Scores obtained on the following parts of the McCullough-Word Analysis Test, namely Initial Blends and Diagraphs, Phonetic Discrimination, and Matching Letters to Sounds, were negative and significant at the .05 level of confidence.

3. Scores obtained on the following parts of the McCullough-Word Analysis Test, namely: Sounding Words, Interpreting Phonetic Symbols and Syllabication were negative and not significant at the .05 level of confidence.

4. Scores obtained on the following parts of the Gilmore Oral Reading Test, namely: Substitutions, Hesitations, and Repetitions were negative and not significant at the .05 level of confidence.

The evidence from the study suggests that implicit speech did not enhance the ability of the experimentees to secure appropriate answers on the Wepman Auditory Discrimination Test and the Spache Spelling Test. Since correlations were negative, an inverse relationship existed between incidence of recorded implicit speech and scores obtained on these two measures. A second inverse relationship was apparent between incidence of recorded implicit speech and words spelled correctly on the Spache Spelling Test. An inference could be drawn that most of the implicit speech did not aid students to spell more words correctly.

On the basis of the data secured from the study, the conclusions drawn thereof have raised many questions. Some answers appear to be logical; others are baffling.

One very significant conclusion that was drawn from the data is that implicit speech, as defined in this study, is a natural adjunct of the reading process, and furthermore that it (implicit speech) is possibly a residue of initially learned oral language patterns. Evidently, therefore, that emphasis upon silent reading, with the subsequent de-emphasis upon oral reading, has not resulted in the extinction of implicit speech. It should be borne in mind, however, that reading achievers, as defined in this study, exhibited less recorded implicit speech than did retardates. An inference can be drawn, therefore, that while a decrement in this phenomena will naturally occur as students acquire maturity in language skills, at no point in the life of an individual will this behavior be reduced to zero. Therefore, an educational implication can be drawn to wit: that no inhibitory measures, such as saying quiet lips, biting on pencil or eraser, etc., should be used. Rather, every effort should be extended to organize the optimal learning and/or reading environment and to judiciously manipulate it so that students will acquire maturity in reading skills. A high degree of manifestation of implicit speech is related to reading immaturity. The attack should be upon causes rather than upon symptoms.

Do methods or approaches in beginning reading instruction have any bearing upon the manifestation of recorded implicit speech? This question, it can be assumed, has been foremost in the minds of students of this phenomena. It is interesting to note that the data secured from this study indicates that a basal instructional program, augmented by an emphasis upon phonics, did not induce more recorded implicit speech than an instructional program that utilized only materials and methods suggested by the ubiquitous basal reader. The very fact that an emphasis upon phonics in a beginning reading program did not result in more recorded implicit speech, regardless of the mode of presentation of the material read silently, has implications in beginning reading programs. Evidently, teachers need not fear that an adequate phonics program or an emphasized phonics program will result in an undue amount of implicit speech. An overemphasis upon phonics in a beginning reading program may have other side effects, such as an inappropriate attention to comprehension, a main facet in any instructional program.

Many reading programs today are mechanized more or less in that maximum use is made of mechanical and other instructional aids. Varied opinions may be heard as to their usefulness in either developmental and/or remedial programs. An interesting question can be posed at this time. Does the mechanical presentation of reading material induce more or less recorded implicit speech? While not one of the main objectives of the study, yet the data gleaned from the study gives unique insights into the question.

When easy material was presented mechanically, the retardates manifested more recorded implicit speech and scored higher on the comprehension test than did the achievers; however, when the easy reading material was presented non-mechanically, the retardates again manifested more recorded implicit speech, but the achievers obtained a higher score on the comprehension test. One inference that can be drawn from these two findings is that the mechanical presentation of easy material aided the retardates more than the achievers. And furthermore, it can be inferred that implicit speech in these instances served as a secondary reinforcer or was an added sensory input into mental processes employed as the readers approximated the meaning intended by the author. When difficult material was presented mechanically and non-mechanically, the retardates in both instances manifested more recorded implicit speech, but the achievers scored higher on the comprehension test. Thus the reading behavior patterns were not changed from one mode of presentation to the other. Serious questions can be raised concerning the use of the so-called pacers or accelerators. Based on the data secured from the study, easy material mechanically presented is easier for the retardates to comprehend, but did not aid (lack of evidence to the contrary) in the comprehension of difficult material. Since the retardates, in all instances, manifested more recorded implicit speech, and since the use of mechanical devices induced more recorded implicit speech, such mechanical aids should be used judiciously.

In the adult world, among executives, professional people, and others who are required to read or scan literally tomes of material, there is a growing interest in speed reading. In fact this concern has filtered into the high schools. At this juncture, the educator or those responsible for the schools, private and non-private, are expressing concern over this insidious demand for more and more speed while reading silently. Since achievers manifested less recorded implicit speech, and comprehended better than the retardates, would increasing reading rate result in less implicit speech? This raises the question concerning the rate of reading. Is there a rate at which there would be minimal manifestation of this phenomena? This is a legimate area of concern for all who are responsible for the education of our youth. Data secured from this study, may provide some valuable insights into this area of concern. Notwithstanding that, the population in this study were intermediate grade children, the results obtained might be generalized to junior and senior high school students. It was found that as the rate of the mechanically presented material was increased, there was a decrement of recorded implicit speech. But, on the other hand, increasing the rate beyond what research says is the normal reading rate of intermediate grade children did not result in a marked decrease of recorded implicit speech. Therefore, little justification can be made for the so-called speed reading courses if the primary objective is to significantly reduce the incidence of recorded implicit speech. This suggests that one of the best ways to improve rate is to improve the student's ability to comprehend the material. In other words, the attack should be upon the central mental processes of reading rather than upon the peripheral aspects. Speed of comprehension is the desideratum in any instructional program that is designed to improve the rate or speed of reading.

The relationship of recorded implicit speech to selected language processes is still another area of concern to the reading teacher and researchers. Of the many questions that may be asked one seems appropriate at this time, namely: Is implicit speech related to abilities to identify sounds, to discriminate between sounds that are similar, or is it (implicit speech) related to auditory imagery? Do readers sub-vocalize to check the congruency of a sound with the auditory imagery acquired in reading symbols? Such questions are most difficult to answer, and certainly were not objectives of this study. Nevertheless, data from the study may give some insights into possible relationships. For instance, a negatively significant relationship was established between words spelled correctly on the Spache Spelling Test and recorded implicit speech. Another question is posed: Would there be a relationship between recorded implicit speech and words spelled incorrectly if the spelling errors made were predominately phonetic ones? The answer, since we have not concrete evidence, must be a speculative one. One possible answer would be that a positive correlation would exist. Again, it could be easily assumed that implicit speech would be related to the ability to discriminate between sounds that were somewhat similar in nature. The data obtained revealed that there was a relationship but that it was a negative one. In other words, a high manifestation of implicit speech was associated with inability to discriminate words in the Wepman Auditory Discrimination Test. Again, a negative relationship was established between scores on selected parts of the McCullough Word Analysis Test, such as the ability to recognize Initial Blends and Diagraphs, Phonetic Discrimination, and matching letters to sounds. This correlation was negative and significant at the .05 level of confidence. Again negative correlations were obtained between implicit speech and Sounding Words, Interpreting Phonetic Symbols, and Syllabication. These latter correlations were not significant at the .05 level of confidence. The total score obtained on the McCullough Word Analysis Test and the incidence of recorded implicit speech was negative and significant at the .01 level of confidence when the reading material was presented non-mechanically.

From the above paragraph, it can be inferred that implicit speech as measured in this study does not correlate positively with the language processes as measured by the tests enumerated. And furthermore, it can be inferred that there is no cause and effect relationships between the variables mentioned.

A final question to be considered in this section involves the relationship, if any, between recorded implicit speech and efficiency of comprehension. Is there a cause and effect relationship between the two? Inferences drawn from the data provides some insight into this question. When easy material was presented mechanically, the retardates exhibited more implicit speech and scored higher on the comprehension test. Both differences were significant at the .05 level of confidence. It might be inferred that the easy material was not challenging for the achievers and therefore they did not perform at their optimal level. Another inference is that the retardates made maximum use of implicit speech, either as a reinforcing medium or as an added sensory input into the thinking processes employed as they approximated the meaning intended by the author. While reading difficult material presented mechanically the achievers manifested less implicit speech but scored higher on the comprehension test. However, the differences were not significant at the .05 level of confidence. On total mechanical presentation, easy plus difficult, the retardates manifested more recorded implicit speech, but the total comprehension scores were about equal to the achievers. Again the retardates exhibited more recorded implicit speech but comprehended the material with the same efficiency. This fact lends credence to the inference that implicit speech enhanced the ability of the retardates to comprehend the material to a greater degree than it aided the achievers. When the material was presented non-mechanically, the retardates manifested more recorded implicit speech, but the comprehension scores were essentially the same. On easy material non-mechanically presented, the "t" ratio on implicit speech was 1.69, and the "t" on comprehension was 1.11; on the difficult material the "t" ratios were 1.33 and .21 respectively. On total material, easy plus difficult, the "t" ratios were 1.53 and 1.19 respectively. Again the above data lend credence to the inference that implicit speech aids the retardate more than the achiever. It might be inferred, therefore, that there is, particularly with the retardates, a cause and effect relationship between implicit speech and comprehension efficiency.

As stated at the beginning of this section, the data secured from this study raised many questions concerning implicit speech during silent reading. Some of the questions are:

1. What would a longitudinal study reveal? Would college seniors manifest more or less implicit speech than intermediate grade children?

2. What is the relationship between GSR (galvanic skin response) and the manifestation of implicit speech? Do emotionally loaded words induce more implicit speech?

3. What relationship, if any, exists between latency or cortical functioning and implicit speech?

4. With appropriate training, can implicit speech be completely extinguished?

5. Does the student who is overanalytical in word recognition manifest more implicit speech? Or less?

6. What is the relationship between the manifestation of implicit speech and the reading skills of blind students?

7. Do deaf students manifest more implicit speech or less, than the normal child?

8. What is the relationship between implicit speech and heart beat rate?

9. Is there any relationship between alpha brain waves and implicit speech?

10. What are the implicit speech patterns of the brain injured child? The spastic child?

11. Is implicit speech a behavior that can be conditioned?

12. Can myographics be standardized? That is, would they be a medium of communication?

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APPENDIX A

RAW DATA ON TOTAL POPULATION

APPENDIX A

RAW SCORE DATA ON TOTAL POPULATION

													M W A																		
SN	M	DxC	REL	ARL	GRI	GRII	SBIQ	STEP	ASA	SS	UAD	MWAT	1	2	3	4	5	6	7	GA	GC	GTE	GSE	GME	GMPE	GDPE	GIE	GHE	GRE	GOE	1	2
1	1	A	04.3	05.5	68	65	110	39	10	102	34	111	30	24	28			29		41	36	30	9	4	0	8	1	3	4	1	45	36
2	1	A	06.0	07.0	85	88	129	61	8	114	36	111	30	27	30			24		54	40	41	6	12	1	7	0	4	11	0	14	10
3	1	A	02.6	04.2	46	44	111	40	3	58	37	96	29	19	22			26		34	34	35	17	6	2	1	3	3	2	1	43	42
4	1	A	04.0	05.2	58	70	103	47	3	109	36	108	30	22	28			22		55	45	26	8	6	0	4	1	4	3	0	29	23
5	1	A	04.3	05.3		55	96	46	7	112	38	106	30	26	28			22		56	25	25	6	11	0	1	0	0	2	5	32	40
6	1	A	04.7	05.9	67	77	104	55	9	86	40	84	29	27				28		33	28	29	5	1	0	6	4	0	9	4	16	57
7	1	A	05.7	08.5	103	101	137	63	4	114	38	107	20	30	29			28		44	44	41	7	1	1	20	1	5	5	1	36	61
8	1	A	03.6	04.7	56	54	100	29	8	109	38									47	20	36	7	1	11	3	1	6	6	1	29	57
9	1	A	03.9	06.2	79	71	105	47	5	93	38	104	29	25	26			24		51	42	31	9	6	3	5	1	2	5	0	19	17
10	1	A	07.2	08.6	102	100	148	67	15	101	38	202	30	29	30	26	29	30	28	79	48	22	3	11	0	0	3	0	3	2	22	25
11	1	A	07.9	03.6		60	88	40	11	62	36	159	30	20	28	16	18	29	18	58	38	27	12	8	0	2	1	0	3	1	15	16
12	1	A	05.5	06.8	80	75	120	58	8	67	38	173	30	24	28	15	25	29	22	47	32	21	7	5	0	3	2	0	1	3	19	22
13	1	A	08.0	09.0	108	109	115	68	22	111	39	201	30	29	30	25	30	28	29	79	44	27	2	13	1	0	1	1	2	7	42	39
14	1	A	06.8	09.2	110	112	140	62	19	95	36	182	30	29	30	18	24	25	26	31	49	30	5	6	0	4	2	0	10	3	28	25
15	1	A	06.6	05.5	83	80	113	54	11	97		190	30	28	30	24	25	24	29	72	23	41	3	22	2	0	1	0	12	1	17	21
16	1	A	06.7	09.6	118	117	142	76	7	117	38	196	30	29	30	25	27	27	28	66	46	41	6	10	1	4	2	6	11	0	21	18
17	1	A	07.8	10.8	130	130	153	71	20	113	39	195	30	30	30	22	27	26	30	51	42	25	2	11	0	2	2	1	6	1	21	21
18	1	A	07.9	09.2	100	114	134	74	25	101	35	182	30	29	30	16	25	27	25	71	42	38	4	19	2	2	5	0	4	2	44	31
19	1	A	04.9	06.1	76		115	67	9	82	37	179	30	26	29	20	25	26	23	55	33	28	3	4	5	1	2	1	12	0	22	20
20	1	A	05.8	08.8	113		128	62	7	113	39	188	30	27	30	22	21	29	29	68	40	39	7	17	0	9	1	0	5	0	3	29
21	1	A	04.2	06.6	80	88	110	53	6	101	36	179	30	27	28	17	23	27	27	54	39	44	9	9	0	15	3	3	3	2	26	28
22	1	A	04.5	06.2			105	52	7	99	36	186	30	26	30	26	23	26	25	44	31	27	4	5	0	14	0	0	3	1	27	27
23	1	A	04.5	03.8	69	88	93	54	14	88	35	164	30	28	28	30	9	30	19	69	35	39	3	16	2	1	2	2	0	13	25	40
24	1	A	07.9	10.3	65	75	159	73	14		35	204	30	28	30	30	29	29	28	36	38	27	10	0	0	3	4	1	7	2	29	30
25	1	A	05.9	07.7	102	91	132	62	11	105	38	198	30	29	30	25	27	27	30	72	44	37	6	14	3	1	1	0	12	0	25	26
26	1	A	05.7	07.6	85	103	113	55	13	91	36	176	30	26	29	17	22	27	25	40	24	10	4	0	0	3	0	0	3	0	12	14
27	1	A	06.8	08.1	103	97	118	70	13	92	40	182	29	27	30	21	20	29	26	22	43	30	10	10	0	2	2	0	5	1	20	21
28	1	A	04.4	05.9	65	79	109	44	10	85	32	183	30	28	30	19	27	25	24	37	20	29	9	1	0	2	2	1	13	1	22	23
29	1	A	04.8	06.4	85	75	114	48	12	101	40	186	30	29	30	23	19	25	30	53	42	28	8	3	0	0	1	4	11	1	14	10
30	1	A	05.6	06.7	84	82	110	64	12	94	37	184	30	28	29	24	21	26	26	10	25	20	5	0	0	5	1	1	8	0	20	17
31	1	A	05.7	07.4	96	98	126	66	13	88	39	196	30	29	30	22	28	29	28												22	22
32	1	A	07.8	08.9	108	107	141	68	19	113	40	186	30	29	30	22	26	23	26	81	48	19	3	6	0	7	0	0	3	0	23	22
33	1	A	07.2	10.1		117	144	67	10	111	37	198	30	29	30	23	30	30	26	65	45	37	6	9	1	7	0	1	12	1	13	18
34	1	A	08.7	10.4	130	132	170	75	17	116	39	199	30	30	30	25	30	26	28	74	49	25	11	2	0	1	1	3	0	7	15	14
35	1	A	06.0	07.4	80		103	68	13	98	34	181	30	25	28	22	20	29	27	72	44	18	3	7	4	0	1	2	1	0	20	17
36	1	A	05.7	06.9	69	79	102	53	18	111	34	191	30	29	30	24	22	30	26	60	41	20	7	4	1	0	0	5	2	1	14	15
37	1	A	09.7	11.3	125	126	149	76	30		39	148	30	24	30	9	11	23	21	78	47	22	4	8	0	0	7	0	1	2	29	29
38	1	A	08.8	10.5	111	114	129	69	34	108	38	197	30	29	30	22	28	30	28	85	34	15	1	6	1	3	1	0	0	3	28	29
39	1	A	06.3	08.0	86	90	104	65	16	82	39	189	30	28	30	17	26	30	28	53	42	35	9	2	0	4	0	2	13	1	16	15
40	1	A	09.0	10.6	117	123	146	72	26	118	37	199	30	28	30	23	29	29	30	77	45	26	1	11	0	0	7	0	4	3	19	21
41	1	A	07.4	08.8	96	99	117	65	24	110	39	197	30	30	30	21	27	30	29	64	41	28	5	2	0	4	3	4	2	8	21	20
42	1	A	07.4	11.2	132	126	118	72	15	77	34	168	27	28	27	13	21	27	25	81	36	19	6	10	0	0	1	0	0	2	23	23
43	1	A	07.7	09.6	104	102	127	67	25	116	32	191	30	29	30	15	29	30	28	41	41	40	6	3	0	5	5	3	15	3	23	27
44	1	A	07.3	10.2	117	98	126	70	16	114	37	191	30	28	30	21	28	29	25	60	44	30	7	3	0	2	1	0	15	2	7	9
45	1	A	04.8	06.0	57	72	98	53	11	100	35	164	30	26	28	13	17	26	24	58	37	23	7	7	1	0	0	0	6	2	19	28
46	1	A	07.2	08.8	94	97	122	66	19	95	39	198	30	28	30	25	29	26	30	81	43	5	20	2	0	0	0	0	2	3	13	13
47	1	A	06.5	08.1	95	88	128	68	13	111	35	201	30	28	30	25	29	30	29	63	36	28	5	11	0	0	3	5	2	2	19	19
48	1	A	07.5	09.7	98	104	131	66	25	119	38	202	30	28	30	27	29	30	28	84	44	23	6	11	0	2	0	1	1	2	12	11
49	1	A	08.6	10.5	108	114	144	75	22	113	34	201	30	30	30	25	29	30	27	82	46	19	0	7	0	1	5	0	3	3	17	13
50	1	A	08.3	09.5	103	105	163	67	25		39									76	46	24	4	2	1	0	3	8	0	6	10	14

APPENDIX A
RAW SCORE DATA ON TOTAL POPULATION

								N R C								V R S M E									V R S M D									V R S N M E					V R S N M D				
GSE	GME	GMPE	GDPE	GIE	GHE	GRE	GOE	1	2	3	4	5	6	7	8	1	2	3	4	5	6	7	8	MEC	1	2	3	4	5	6	7	8	MDC	1	2	3	4	NMEC	1	2	3	4	NMDC
9	4	0	8	1	3	4	1	45	36	48	62	40	18	26	30	61	60	52	45	48	76	56	51	3	44	44	37	33	32	31	29	26	2	44	42	40	43	4	30	35	25	26	7
6	12	1	7	0	4	11	0	14	10	13	17	13	17	13	19	20	11	10	7	6	8	6	4	5	13	5	4	5	5	7	5	3	3	8	9	11	12	7	5	10	6	2	2
17	6	2	1	3	3	2	1	43	42	47	54	42	48	42	42	80	80	75	74	76	74	74	74	3	90	89	88	89	90	89	92	90	3	42	37	37	32	6	43	35	39	34	6
8	6	0	4	1	4	3	0	29	23	37	18	17	22	29	16	19	8	14	11	14	12	9	11	4	17	14	23	22	17	15	11	7	2	17	22	22		5	29	19	13	19	4
6	11	0	1	0	0	2	5	32	40	36	35	62	41	39	44	48	39	37	38	37	37	49	47	3	48	39	37	38	37	37	54	37	3	34	34	29	26	5	32	25	34	22	0
5	1	0	6	4	0	9	4	16	57	23	24	30	35	21	21	49	51	49	50	52	53	52	53	4	44	45	45	47	48	48	47	46	2	25	20	19	20	5	17	13	22	13	3
7	1	1	20	1	5	5	1	36	61	47	39	26	36	28	35	57	56	54	56	56	56	58	60	5	82	81	71	73	69	66	66	52	5	50	29	26	28	8	32	21	27	21	4
7	1	11	3	1	6	6	1	29	57	42	41	29	24	19	39	62	67	64	79	71	63	62	61	5	93	83	93	98	89	86	70	69	1	24	31	33	30	3	21	23	29	36	6
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12	8	0	2	1	0	3	1	15	16	18	19	14	21	20	30	25	22	27	28	30	32	31	28	3	35	38	41	43	38	40	53	40	1	40	30	36	30	5	32	33	34	35	4
7	5	0	3	2	0	1	3	19	22	26	28	20	23	18	22	25	14	12	16	12	13	13	12	4	27	17	17	16	15	14	15	17	1	40	30	35	32	7	32	33	34	35	5
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3	22	2	0	1	0	12	1	17	21	27	19	23	24	20	22	32	28	27	29	28	26	27	27	4	18	29	32	29	28	28	28	26	2	14	18	15	17	8	19	15	20	16	7
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4	19	2	2	5	0	4	2	44	31	37	33	35	40	42	37	83	88	95	98	96	95	99	11	5	70	70	58	63	60	63	64	70	5	33	25	32	32	10	79	47	43	38	6
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7	17	0	9	1	0	5	0	3	29	31	28	21	25	23	20	28	35	33	36	33	35	33	36	5	37	38	40	37	23	35	33	36	5	18	16	17	17	7	18	13	22	13	3
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10	0	0	3	4	1	7	2	29	30	33	31	33	36	38	29	81	81	82	81	78	82	86	90	4	69	66	64	65	79	86	67	89	4	26	28	31	25	7	26	19	12	9	9
6	14	3	1	1	0	12	0	25	26	25	23	24	24	26	24	51	50	50	50	50	58	50	50	3	51	49	51	52	57	52	50	50	4	25	23	23	21	10	25	22	22	26	4
4	0	0	3	0	0	3	0	12	14	15	17	13	16	18	12	15	12	13	14	15	14	17	16	5	12	14	13	14	16	15	16	17	5	13	17	8	14	8	15	9	9	8	2
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5	0	0	5	1	1	8	0	20	17	17	13	18	18	12	13	26	23	23	24	21	23	24	24	4	22	24	23	24	22	22	24	23	2	16	14	9	15	5	17	18	15	15	3
								22	22	18	20	20	20	13	15	29	33	34	36	35	33	32	32	5	30	27	27	26	24	26	25	22	5	12	9	15	12	9	14	12	16	13	3
3	6	0	7	0	0	3	0	23	22	20	30	28	22	24	23	36	37	39	37	43	36	37	36	5	28	32	32	29	27	28	28	24	5	19	25	13	25	7	24	16	22	15	4
6	9	1	7	0	1	12	1	13	18	13	16	14	15	12	16	24	21	22	18	22	18	19	18	5	19	16	19	14	19	14	12	16	5	16	15	15	18	6	15	6	8	16	3
11	2	0	1	1	3	0	7	15	14	13	15	16	21	23	18	31	32	33	35	34	33	35	36	4	32	32	31	35	34	30	32	22	4	12	14	12	11	9	17	11	11	14	7
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7	4	1	0	0	5	2	1	14	15	16	17	11	15	12	16	22	17	19	18	19	19	22	27	5	26	23	22	24	20	15	15	20	3	16	16	15	17	9	22	14	20	10	2
4	8	0	0	7	0	1	2	29	29	29	22	30	30	24	34	57	60	51	55	51	51	52	64	5	58	64	64	55	51	54	53	56	5	31	27	23	32	7	31	33	30	27	7
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6	3	0	5	5	3	15	3	23	27	26	30	32	30	29	29	67	60	64	57	66	58	58	60	3	68	72	71	72	69	85	78	77	4	34	26	28	28	10	27	38	39	48	4
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5	11	0	0	3	5	2	2	19	19	22	17	20	20	15	18	41	40	40	41	46	42	43	59	4	39	40	40	46	39	43	42	36	3	28	25	28	16	10					
6	11	0	2	0	1	1	2	12	11	16	9	9	9	14	13	16	14	14	16	16	11	16	20	3	16	16	15	21	14	15	13	19	4	6	10	11	5	9	8	7	6	11	8
0	7	0	1	5	0	3	3	17	13	17	14	15	16	17	14	16	19	19	18	18	16	16	16	5	25	19	19	17	18	16	16	17	5	12	10	7	8	9	11	11	8	11	6
4	2	1	0	3	8	0	6	10	14	15	15	11	10	9	10	23	14	13	12	16	13	14	14	5	11	9	11	10	9	10	11	11	5	10	6	7	4	10	14	6	9	5	6

APPENDIX A

RAW SCORE DATA ON TOTAL POPULATION

(Con'd.)

													H M A																		
SN	M	DxC	REL	ARL	GRI	GRII	SBIQ	STEP	ASA	SS	WAD	MMAT	1	2	3	4	5	6	7	GA	GC	GTL	GSE	GME	GMPE	GDPE	GIE	GHE	GRE	GTE	1	2
51	1	A	07.6	08.7	89	97	125	65	21	105	35	192	30	28	30	20	26	30	28	66	36	25	8	9	0	2	0	2	2	2	23	29
52	1	A	05.6	07.1	80	77	96	49	21	103	36	189	30	29	30	18	28	30	24	69	26	42	9	24	0	5	0	4	0	0	12	12
53	1	A	10.4	08.3	108	114	139	70	23	118	38	203	30	30	30	25	29	29	30	68	47	22	3	0	0	6	1	3	6	3	8	15
54	1	A	05.9	07.4	82	83	110	62	14	98	34	167	30	16	29	14	21	30	27	63	40	17	3	5	5	1	0	2	0	1	16	11
55	1	A	03.9	06.1	68	70	91	50	18	103	36	192	30	27	30	21	28	29	27	60	39	20	1	13	0	1	0	0	4	1	31	26
56	1	A	09.8	10.8	113	115	136	71	36	118		194	30	29	30	21	26	30	28												23	25
57	1	R	06.1	05.4	65	71	126	64	10	108	35	113	30	27	30			26		36	36	36	10	8	2	0	6	1	7	2	54	44
58	1	R	05.1	05.4	50	57	112	51	11	77	34	102	30	23	27			29		37	34	13	7	0	0	3	1	0	2	0	16	22
59	1	R	07.0	10.1	39	30	129	47	10	90	40	110	27	25	29			29		22	33	32	9	1	1	3	2	0	17	0	28	27
60	1	R	03.7	03.0	23	23	100		5	36	36	91	28	14	25			24		19	20	38	9	0	11	6	1	3	7	1	20	29
61	1	R	07.3	06.8	91	79	140	69	14		40	114	28	28	30			28		63	39	18	5	5	1	0	1	1	5	0	36	31
62	1	R	06.1	05.1	54	65	105	59	15	110	37									47	35	34	6	6	5	6	0	3	6	2	20	21
63	1	R	04.3	02.8	22	13	97	41	13	89	35	80	28	11	26			25		29	25	37	7	4	3	3	0	4	15	1	78	65
64	1	R	09.0	08.0	100	98	122	69	31	104	39	187	29	29	30	23	29	18		45	41	37	3	3	0	14	6	6	3	2	19	37
65	1	R	06.6	08.1	80	81	124	63	18		39									54	31	31	2	4	0	12	0	6	4	3	2	9
66	1	R	05.5	04.7	48	59	108	53	13	76	37	112	28	29	28			27		43	40	29	7	9	5	3	2	1	0	2	31	25
67	1	R	05.1	04.3	47	49	119	52	12	91		115	29	29	29			28		30	31	19	9	0	5	0	0	1	4	0	24	[illegible]
68	1	R	04.6	04.0		42	110	44	13	78	36	97	29	17	23			28		38	29	28	5	8	3	1	1	1	1	8	32	[illegible]
69	1	R	05.2	04.6	53	50	106	54	10	89	37	101	28	19	28			25		45	34	48	3	22	9	2	0	3	6	3	18	23
70	1	R	05.0	03.1		34	118	48	12	33	35	99	28	17	27			27		29	27	30	11	1	7	1	0	1	8	1	31	[illegible]
71	1	R	08.6	06.6	89	85	144	65	33		38									61	32	37	8	10	0	5	1	7	4	2	47	[illegible]
72	1	R	04.2	03.7	35	41	108	36	15	68	38	94	30	17	25			22		37	29	29	10	2	4	0	2	0	10	1	21	22
73	1	R	07.5	06.1	99	91	122	71	23	104	35	192	30	29	30	22	25	27	29	74	35	30	3	19	0	1	2	0	0	5	25	[illegible]
74	1	R	06.1	05.1	56	65	109	55	7	105	37	110	30	26	26			28		60	37	21	3	13	0	1	0	0	4	0	16	[illegible]
75	1	R	05.7	04.1	53	36	125	51	15	72	38	110	30	27	26			27		15	19	26	11	0	0	3	0	1	11	0	24	[illegible]
76	1	R	05.5	04.6	49	57	120	59	15	75	36	107	30	26	27			24		48	42	26	7	10	0	2	0	0	6	1	26	[illegible]
77	1	R	07.9	06.1	83	61	123	62	33		37									37	41	38	11	8	0	12	0	0	7	0	21	[illegible]
78	1	R	06.5	04.9	52	62	100	70	11	107	39	111	30	27	29			25		17	38	34	9	2	0	11	2	0	5	3	42	[illegible]
79	1	R	06.8	05.3	64	65	124		11	101	38	112	29	27	28			28		27	33	48	16	28	2	0	0	0	0	2	22	[illegible]
80	1	R	06.2	04.9	46	54	108	65	12	49	39	174	29	27	28	15	23	29	23	18	30	36	10	1	2	4	2	0	14	3	27	[illegible]
81	1	R	07.7	07.1	105		114	66	16	101	37	190	29	29	30	26	26	29	28	55	43	37	8	10	0	2	8	0	6	3	22	[illegible]
82	1	R	07.1	06.2	76	76	131	66	15	97	37	182	30	27	30	20	23	26	26	32	43	28	2	10	5	2	0	1	7	1	30	[illegible]
83	1	R	11.5	08.2	82	85	118	65	36	97	32	197	30	29	30	24	28	27	29	70	36	30	2	18	1	1	0	2	4	3	16	[illegible]
84	1	R	08.2	06.8	92	76	122	75	20	94	36	185	30	28	30	19	25	29	24	58	40	36	0	27	0	0	3	3	0	5	32	[illegible]
85	1	R	05.8	04.2		51	123	69	7	38	30	157	29	20	27	17	17	23	24	21	30	19	1	0	0	0	5	0	9	6	20	[illegible]
86	1	R	05.7	04.8	50	67	111	60	19	56	38	147	29	21	24	21	7	25	30	38	27	23	11	6	0	0	1	0	2	3	46	[illegible]
87	1	R	06.7	05.9	81	64	126	54	22	110	39	194	30	29	30	26	28	28	23	45	38	27	4	4	0	3	2	3	8	2	15	[illegible]
88	1	R	06.2	05.7	69	72	128	64	10	71	37	172	30	25	29	24	17	25	22	54	41	27	2	7	8	0	2	0	8	0	33	[illegible]
89	1	R	08.1	06.9	91		130	71	18	109	34	203	30	29	30	25	30	30	29	55	40	34	3	6	1	1	0	1	16	6	29	[illegible]
90	1	R	09.3	07.1	83	94	128	69	25	114	39	202	30	29	30	24	30	30	29	74	39	41	10	14	0	4	1	0	3	9	37	[illegible]
91	1	R	06.7	06.1	78	66	145	62	22	104	37	191	30	27	30	22	28	30	26	67	35	38	4	23	0	0	0	2	9	0	24	[illegible]
92	1	R	08.9	08.3	99	106	152	74	32	111	37	190	30	29	30	19	25	30	27	76	42	26	2	14	2	0	0	1	4	3	17	[illegible]
93	1	R	06.5	05.8	68	71	118	60	35	95	38	182	30	30	30	17	23	23	29	68	37	35	3	38	0	0	0	0	2	1	17	[illegible]
94	1	R	05.7	05.1	47	74		55	15	95	36	173	30	23	30	18	18	29	25	32	38	51	14	5	0	7	8	0	12	5	24	[illegible]
95	1	R	04.0	03.5	25	41	101	44	9	19		145	30	21	27	8	15	22	20	8	35	25	13	0	3	2	1	1	5	0	23	[illegible]
96	1	R	05.8	05.3	59	62		52	22	91	38	182	30	25	26	25	22	25	27	56	18	23	1	4	1	2	2	3	11	2	16	[illegible]
97	1	R	06.9	06.3	87	66	139	63	16	70	37	189	30	29	33	21	28	23	28	63	42	29	4	9	2	0	1	1	5	6	18	[illegible]
98	1	R	05.5	04.7	53	50	122	64	11	47	35	179	30	29	29	18	26	32	25	26	36	39	3	0	6	0	2	2	27	0	19	[illegible]
99	1	R	06.0	05.9	61	82	113	54	23	75	36	176	30	27	30	17	25	24	25	26	31	35	10	10	0	4	3	2	5	3	21	[illegible]
100	1	R	06.8	06.0	72	57	102	65	16	52	33	185	30	25	30	19	25	30	26	58	41	25	6	14	1	1	0	0	1	1	13	[illegible]

APPENDIX A
RAW SCORE DATA ON TOTAL POPULATION
(Con'd.)

									WRC								VRSWE									VRSMD									VRSHWE					VRSHMD				
TS	CSE	CME	CMPE	CIPE	CIE	CHE	CRE	CTE	1	2	3	4	5	6	7	8	1	2	3	4	5	6	7	8	WEC	1	2	3	4	5	6	7	8	MDC	1	2	3	4	HWEC	1	2	3	4	HMDC
25	8	9	0	2	0	2	2	2	23	20	21	24	21	21	25	18	44	45	40	43	42	51	47	50	3	40	53	40	52	50	54	54	58	4	23	24	17	15	8	25	20	24	22	4
42	9	24	0	5	0	4	8	0	12	12	17	20	15	18	17	16	30	27	26	28	26	29	28	30	4	8	7	9	17	8	8	10	13	1	20	17	18	16	8	17	14	16	15	5
22	3	0	0	6	1	3	6	3	8	15	8	12	14	8	16	19	9	7	5	7	4	5	8	6	5	12	15	13	12	15	10	11	10	5	12	9	12	13	6	7	4	9	8	5
17	3	5	5	1	0	2	8	1	16	11	13	14	15	13	11	12	23	19	18	20	18	18	19	23	5	30	27	27	29	21	30	26	26	4	13	8	13	9	10	14	14	15	11	4
20	1	13	0	1	0	0	4	1	31	26	24	26	26	23	30	30	61	59	58	57	60	65	63	69	3	60	59	62	58	58	60	63	65	3	26	29	27	26	10	26	17	31	27	6
									23	25	25	28	24	32	29	31	50	61	65	90	66	54	49	56	5	49	52	52	58	46	50	52	54	5	26	23	16	24	8	27	23	27	29	6
56	10	8	2	0	6	1	7	2	54	44	42	40	44	48	40	50	42	36	37	41	37	36	40	40	5	60	49	52	37	40	47	40	33	3	35	41	33	36	5	42	44	42	36	2
13	7	0	0	3	1	0	2	8	16	22	20	15	13	13	14	11	20	8	8	8	6	7	10	12	3	9	6	6	6	6	9	10	8	3	9	13	10	5	7	12	18	8	14	0
32	9	1	1	3	2	0	17	0	28	27	41	23	16	25	19	19	30	16	17	21	20	22	17	20	5	18	26	17	17	18	16	14	18	3										
58	9	0	11	6	1	3	7	1	20	29	23	24	31	23	29	25	29	19	18	17	18	17	16	21	3	26	20	20	22	18	19	31	55	0										
18	5	5	1	0	1	1	5	0	36	31	18	19	25	21	29	32	30	23	20	21	27	30	21	20	5	19	23	29	20	18	20	21	22	2	19	17	22	13	5	21	19	14	20	1
34	6	6	3	6	0	3	6	2	20	21	27	21	27	22	27	18	13	12	12	11	12	9	11	10	4	17	13	14	21	13	8	26	9	4	11	14	16	9	7	17	9	13	11	3
37	7	4	3	3	0	4	15	1	79	65	64	67	65	56	63	68	65	67	64	62	64	60	58	60	3	64	59	69	71	71	66	64	65	4	79	76	74	80	4	75	72	73	63	5
37	3	3	0	14	6	6	3	2	19	27	26	15	14	10	16	16	65	67	66	65	65	64	60	63	2	63	59	59	60	61	56	58	57	2	20	30		18	8	18	21	22	17	2
31	2	4	0	12	0	6	4	3	2	9	9	9	9	5	10	6	16	7	6	7	5	3	5	7	4	4	4	4	5	3	4	6	5	3	9	7	26	7	8	8	2	8	4	7
19	7	9	5	3	2	1	0	2	31	25	25	16	26	33	29	26	32	50	56	45	48	38	35	45	5	53	47	51	44	42	40	44	38	5	50	51	68	45	6	56	43	37	20	2
19	9	0	5	0	0	1	4	0	24	33	30	25	35	42	37	33	70	68	66	63	66	64	64	65	4	64	60	60	42	37	33	26	39	4	29	23	21	31	7	26	21	16	14	9
18	5	8	3	1	1	1	1	8	32	29	28	22	35	25	31	23	41	34	33	31	45	35	32	34	5	45	67	38	38	31	30	34	40	3	26	31	27	24	8	34	21	33	26	6
18	3	22	8	2	0	5	6	3	18	23	31	38	25	20	25	21	70	69	68	67	67	64	68	64	5	66	65	63	63	60	60	63	64	5	41	23	24	25	7	26	19	25	29	4
10	11	1	7	1	0	1	8	1	21	26	24	23	26	21	25	28	42	43	43	39	44	40	40	42	5	41	40	38	41	40	41	41	41	3	65	24	25	33	5	31	27	24	32	10
17	8	10	0	5	1	7	4	2	47	37	38	35	36	26	28	27	67	66	67	73	67	68	60	60	3	85	82	88	88	86	87	88	88	4	24	28	36	28	4	33	31	30	28	5
29	10	2	4	0	2	0	10	1	21	22	22	26	27	35	36	18	42	43	30	41	39	38	39	35	3	34	32	33	33	32	33	31	40	3	22	21	28	14	6	32	19	36	19	3
30	3	19	0	1	2	0	0	5	25	32	21	17	32	24	32	29	18	12	24	8	11	9	8	7	3	16	9	13	11	10	13	9	8	3	15	15	14	22	6	18	16	10	17	5
31	3	13	0	1	0	0	4	0	16	28	17	21	17	28	21	28	28	31	29	35	25	21	17	20	4	29	28	20	29	30	36	33	32	3	14	19	16	18	8	23	16	26	24	3
16	11	0	0	3	0	1	11	0	24	25	19	34	16	17	27	23	29	25	24	26	23	22	21	24	3	22	21	20	18	19	19	22	23	2	11	18	10	17	4	14	8	10	13	4
16	7	10	0	2	0	0	6	1	26	22	18	19	24	23	20	21	40	35	33	38	37	29	29	34	4	45	40	41	42	47	38	36	39	1	17	20	22	23	9	20	12	13	17	6
28	11	8	0	12	0	0	7	0	21	24	21	21	20	26	18	29	25	18	15	11	14	9	11	11	4	25	27	18	12	13	18	21	14	2	22	17	20	22	5	32	18	23	18	2
34	9	2	0	11	3	0	5	5	42	42	62	40	64	62	45	45	71	60	75	28	26	26	22	22	5	58	56	62	55	55	56	58	57	2	17	18	18	17	7	13	14	18	13	8
18	16	28	2	0	0	0	0	2	22	22	27	20	21	19	18	23	19	23	25	26	27	30	35	35	4	31	25	22	21	21	23	23	23	0	23	13	17	12	6	16	22	17	16	3
56	10	1	2	4	3	0	14	3	27	37	38	31	20	23	24	27	53	55	55	55	54	54	54	56	6	41	45	44	45	43	46	46	43	4	24	31	19	20	5	21	21	17	16	6
17	8	10	0	2	8	0	6	5	22	23	34	19	19	17	17	28	25	22	24	23	21	24	22	24	6	29	24	26	22	24	23	22	20	2	25	26	31	19	8	17	28	20	16	3
18	2	10	5	2	0	1	7	1	30	18	27	15	19	16	21	13	19	14	16	14	13	14	14	13	4	11	25	13	12	10	12	12	15	4	18	12	25	20	9	10	9	11	11	4
30	2	18	1	1	0	2	4	2	16	18	22	21	20	22	24	29	31	32	30	40	30	30	30	30	4	33	32	31	31	31	34	31	31	3	21	24	25	10	10	20	22	18	16	7
36	0	27	0	0	3	3	0	3	32	32	21	22	18	21	23	24	59	62	61	53	63	54	54	58	4	59	62	61	53	53	54	55	55	1	24	26	22	17	8					
19	1	0	0	0	5	0	9	4	20	35	35	27	35	40	35	29	46	51	44	36	45	48	48	51	5	44	38	41	41	42	41	57	38	5	36	36	30	27	8	35	28	30	32	6
13	11	6	0	0	1	0	2	3	46	58	53	50	47	43	41	30	57	60	62	62	61	60	60	60	4	56	56	61	61	61	61	61	65	5	38	35	37	38	7	35	36	34	33	8
17	4	4	0	3	2	3	8	2	15	22	22	15	24	17	22	14	22	15	15	17	11	10	12	12	4	18	15	16	20	21	20	17	22	1	29	29	25	18	5	13	8	13	15	6
17	2	7	8	0	2	0	8	0	22	16	29	27	22	22	18	29	27	36	27	29	32	35	32	35	5	30	35	32	37	32	32	35	40	3	16	26	23	20	7	21	19	20	21	5
14	3	6	1	1	0	1	16	6	20	13	13	14	11	13	20	19	21	19	21	22	20	20	26	23	5	19	17	17	18	16	17	19	22	4	21	21	23	18	8	14	10	8	11	3
11	10	14	0	4	1	0	3	9	27	23	32	31	22	34	28	31	66	60	62	62	63	63	67	66	5	60	90	88	66	91	68	88	88	3	30	29	27	22	7	29	30	28	29	4
18	4	23	0	0	0	2	9	0	24	17	19	18	22	19	23	19	38	30	33	26	29	30	32	30	2	24	30	27	28	24	29	27	36	4	14	15	18	19	9	18	10	12	14	5
16	2	14	2	0	0	1	4	3	17	17	29	24	26	25	20	31	19	17	19	17	24	15	16	17	4	15	14	14	12	15	13	14	15	4	15	15	12	12	8	16	9	18	10	3
15	3	39	0	0	0	0	2	1	17	26	20	19	16	16	11	19	14	11	8	14	12	12	10	10	5	13	14	14	15	18	20	17	16	4	34	40	28	16	6	28	27	41	36	1
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15	13	0	3	2	1	1	5	0	23	18	21	22	37	26	23	19	35	30	46	47	43	45	46	41	3	37	41	45	50	50	36	5	9		5	8	6	4						
13	1	4	1	2	2	2	11	2	16	15	20	21	32	18	14	17	25	29	21	19	10	17	16	16	6	21	16	18	15	15	14	16	17	3	16	11	16	7	7	13	11	7	15	2
19	4	9	2	0	1	1	5	6	18	22	27	10	13	12	16	13	60	44	38	43	40	35	37	37	4	28	31	33	27	25	26	28	31	4	12	17	28	16	10	14	15	13	15	7
18	3	0	6	0	2	2	27	0	19	21	20	21	20	21	19	17	20	58	36	38	38	37	38	41	5	17	17	18	18	28	34	30	30	3	24	25	31	29	8	24	28	27	18	9
15	10	10	0	4	2	2	5	3	21	16	25	26	29	24	20	21	67	65	66	41	41	44	43	51	5	48	42	42	42	41	43	42	40	1	18	14	16	20	5	21	17	16	17	8
15	6	16	1	1	0	0	1	1	15	8	13	13	16	25	19	21	38	46	50	21	49	40	41	40	4	15	13	14	8	8	1	8		4	9	8	6	6						

APPENDIX A

RAW SCORE DATA ON TOTAL POPULATION

(Con'd.)

													NVA																		
SN	M	DxC	REL	ARL	CRI	CRII	ISOL	STEP	ADS	SS	WHD	WHAT	1	2	3	4	5	6	7	SA	SC	CTR	COS	ORB	OPPS	OPPT	COI	AAC	COL	OTR	1	2
101	1	R	07.0	05.7	101	97	120	71	15	110	30	193	30	30	30	19	20	27	28	81	46	23	7	9	0	0	3	3	2	2	21	22
102	1	R	08.1	06.8	81	73	130	67	26	94	38	198	30	29	30	26	25	29	29	76	43	34	1	9	1	0	1	1	1	1	14	36
103	1	R	06.5	08.6	70	54	111	69	15	81	39	173	30	20	29	22	23	26	23	48	43	41	11	4	7	1	3	3	8	1	14	11
104	1	R	08.3	07.2	82	77	116	70	22	58	38	192	31	28	30	27	26	25	26	58	41	40	9	17	3	4	0	0	3	0	16	16
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140	2	A	04.5	08.6		73	107		18		30	104	30	29	30	25	23	28	27	51	40	51	12	9	0	11	3	3	8	[illegible]	8	26
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147	2	A	04.5	05.3	69	73	85	48	17	69	36	103	30	20	30	18	18	29	28	46	37	30	6	5	1	1	5	0	6		23	25
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150	2	A	05.7	07.1	86	65	103	54	19	112	40	200	30	30	30	24	28	29	28	66	37	40	8	20	0	6	1	0	7		23	14

APPENDIX A

RAW SCORE DATA ON TOTAL POPULATION

(Con't.)

APPENDIX A

RAW SCORE DATA ON TOTAL POPULATION

(Cont'd.)

APPENDIX A

RAW SCORE DATA ON TOTAL POPULATION

(Cont'd.)

APPENDIX B

SELECTED TESTS USED TO IDENTIFY POPULATION

3

Appendix B

Selected Tests Used to Identify Population

American School Achievement Test, Form E, Intermediate Battery - Willis E. Pratt and Robert V. Young, Bobbs-Merrill Company, Inc., Indianapolis 6, Indiana, 1955.

Auditory Discrimination Test, Form I - Joseph Wepman, 950 East 59th Street, Chicago, Illinois 1958.

Gates Reading Survey, Form I - Arthur Gates, Bureau of Publications, Teachers College, Columbia University, 525 West 120th Street, New York, New York, 1958.

Gilmore Oral Reading Test, Form A - John Gilmore, Associate Professor of Psychology, Boston University, Harcourt, Brace and World, Inc., New York, 1962.

McCullough Word Analysis Test - Constance McCullough, Ginn and Company, New York, 1962.

Primary Mental Abilities Test for Grades 4-6 - Thelma Thurstone, University of North Carolina, Science Research Associates Inc., 259 East Erie Street, Chicago, Illinois, 1946.

Sequential Tests of Educational Progress -- Listening - Cooperative Test Division, Educational Testing Service, Princeton, New Jersey, 1965.

Spache Spelling Errors Test - George Spache, Reading Laboratory and Clinic, Anderson Hall, University of Florida, Gainesville, Florida.

Stanford-Binet Intelligence Scale, Form L-M - Houghton, Miflin, Boston, 1960.

APPENDIX C

SAMPLE MYOGRAPHIC MATERIALS

NOTE:

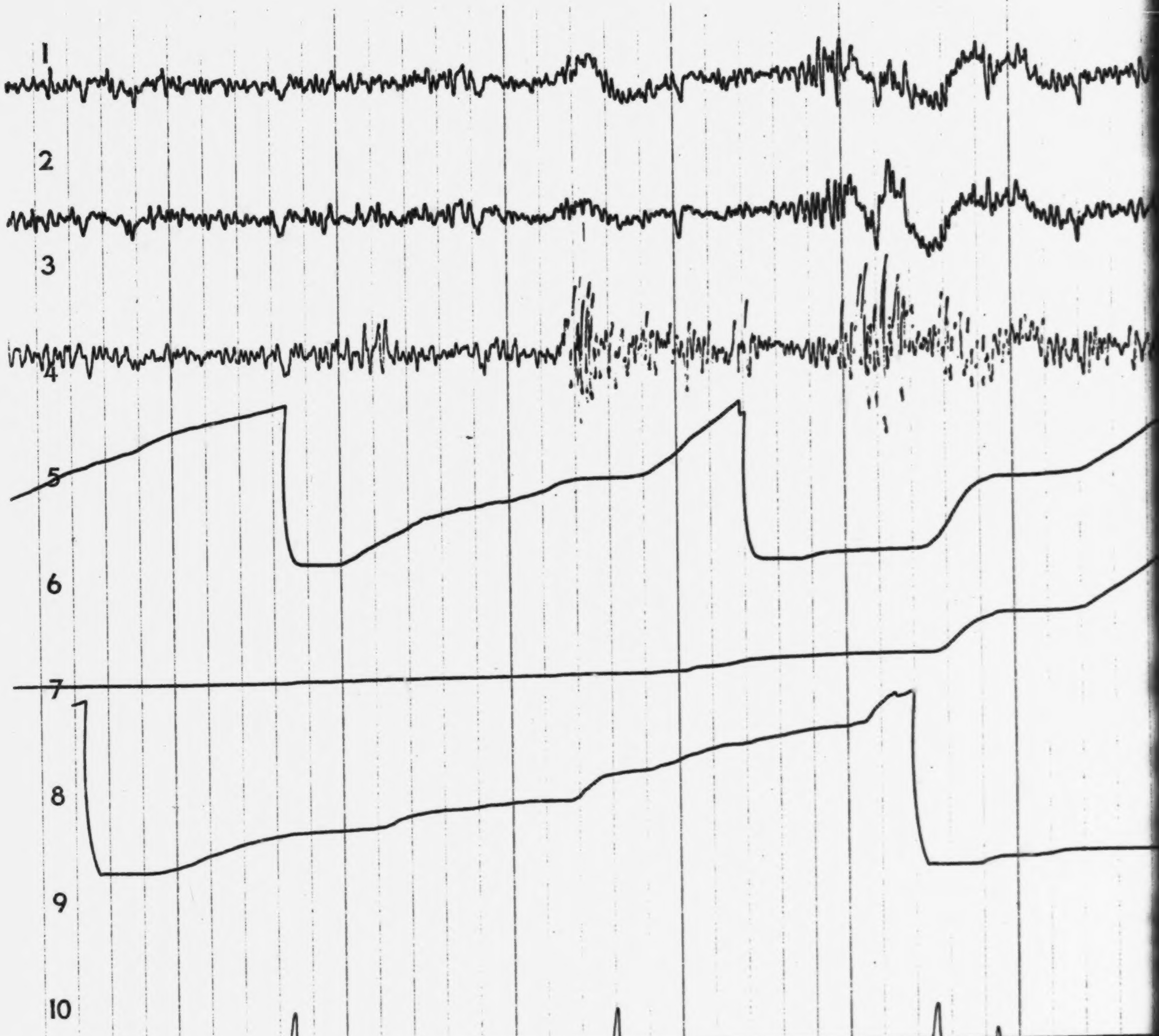
Channels 1, 2, and 3 -- raw electromyographic data

Channels 4, 5, and 6 -- integrated electromyographic data

Channel 7 -- second (time) impulses

Channel 8 -- polygraph of voice

Channel 9 -- impulses synchronized with windows of metronoscope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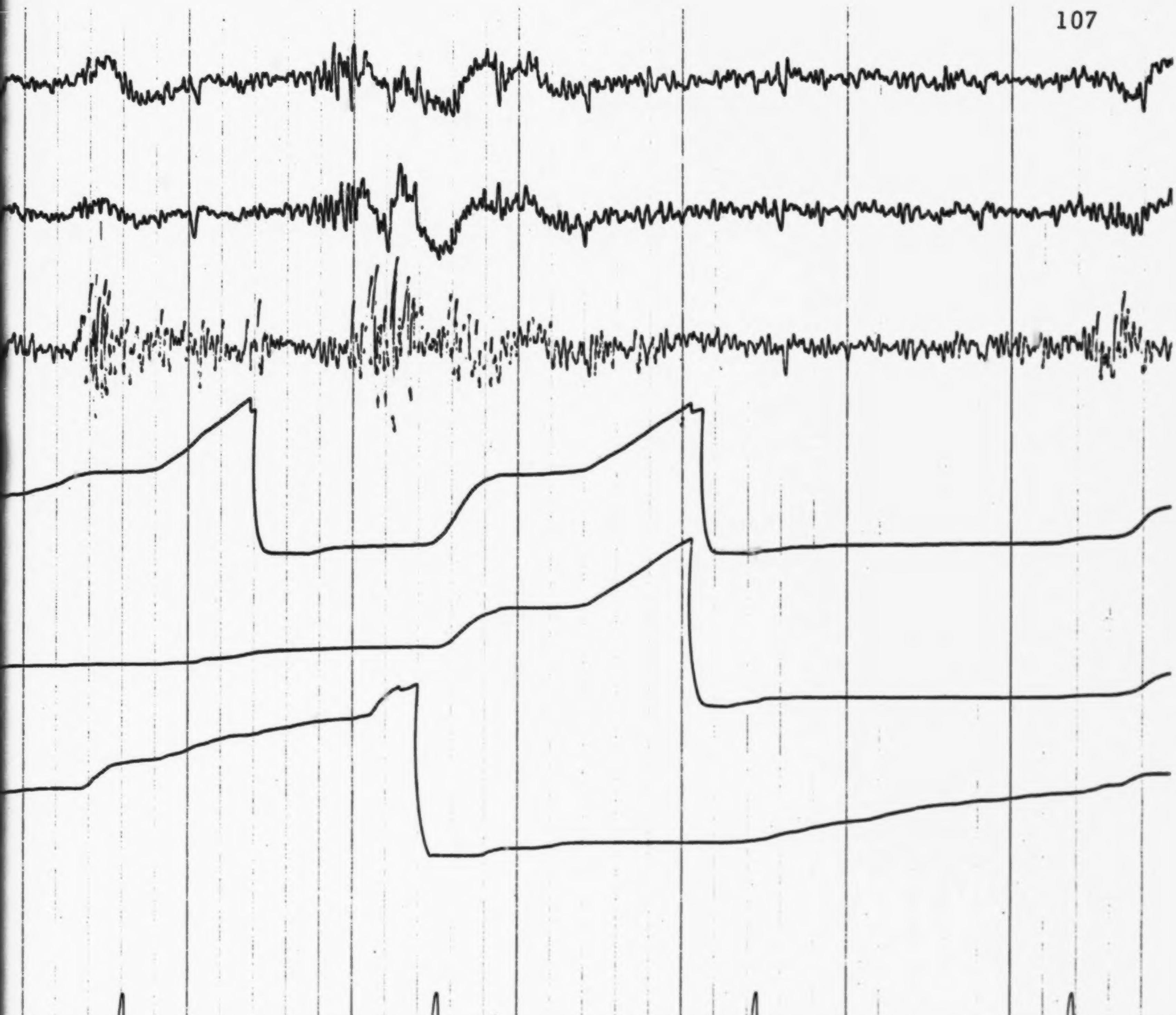

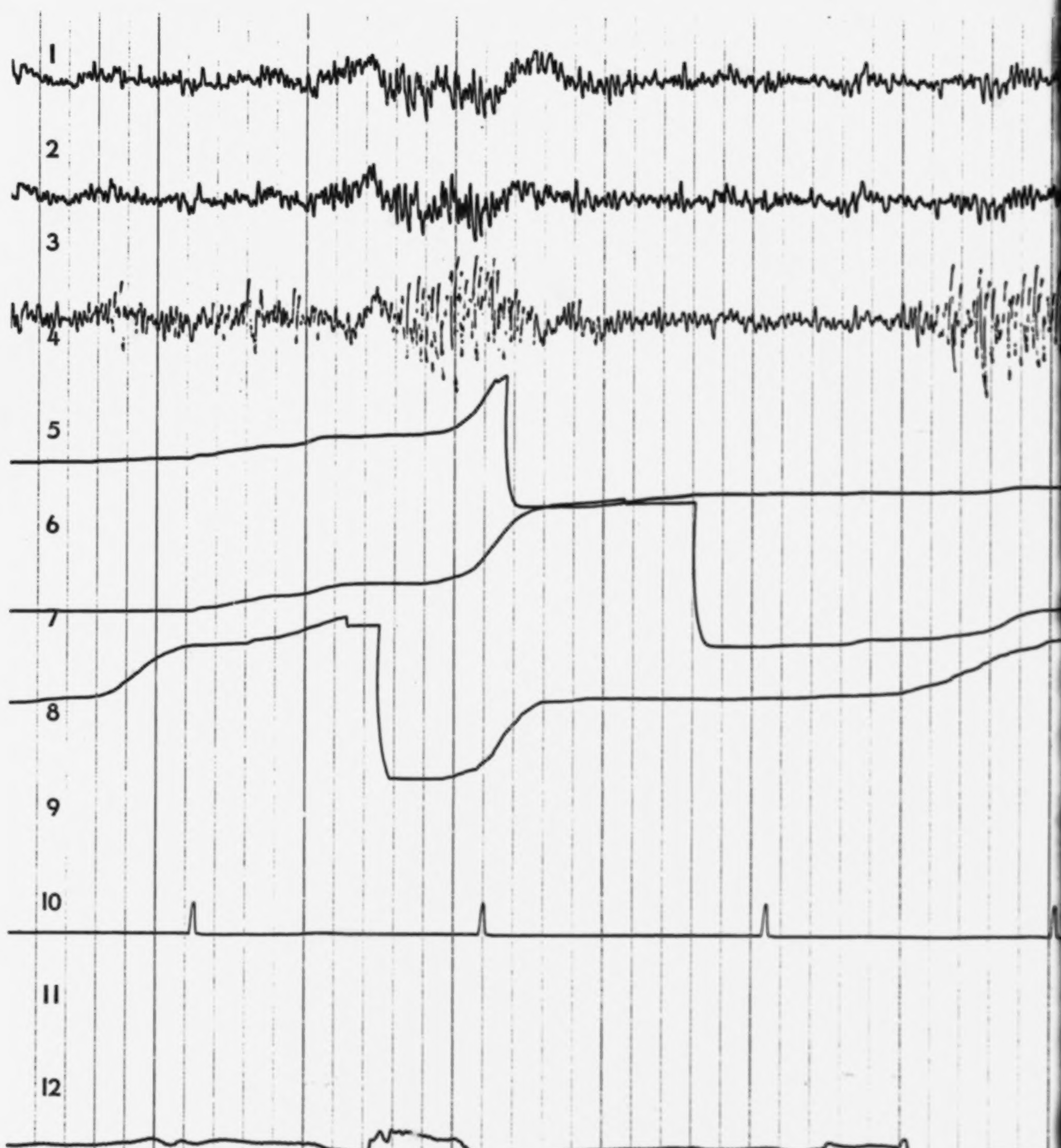
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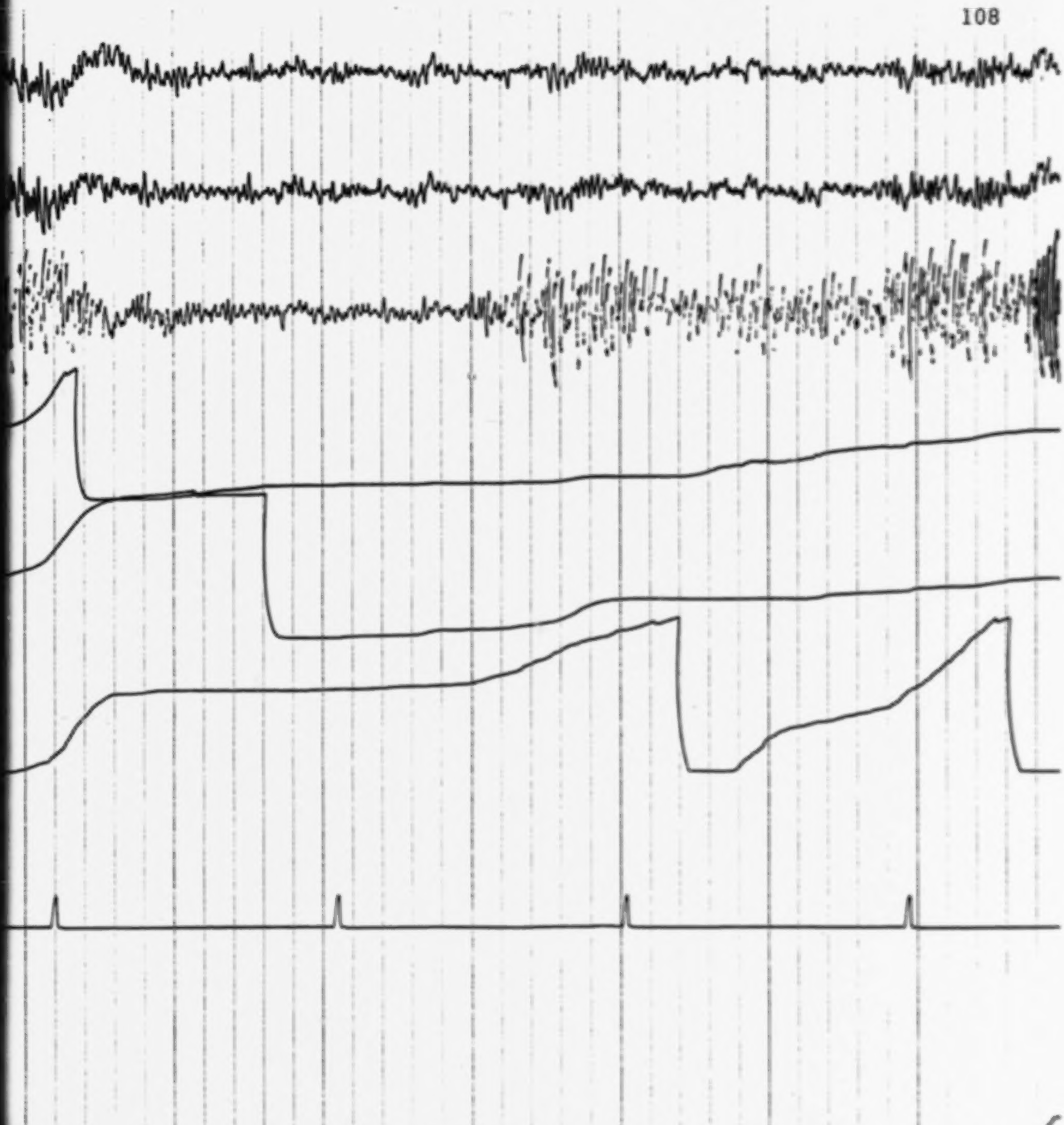

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Vocalism in Silent Reading

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RETRIEVAL TERMS

Vocalism, Implicit Speech, Silent Speech, Sub-vocalization, Inner Speech, Inner Vocalization, Sub-speech

IDENTIFIERS

Electromyography, Muscle Action Potential

ABSTRACT

The study was conducted with the general objectives of determining: (1) the incidence of vocalism during silent reading of two groups of intermediate grade children, i.e., one group of 95 was classified as reading retardates and one group of 116 as reading achievers; (2) whether or not vocalism during silent reading is a desirable, natural and helpful adjunct of reading and learning.

One very significant conclusion that was drawn from patterns of scores is that implicit speech, as defined and measured in this study, is a natural adjunct of the reading process, that it is possibly a residue of initially learned oral language patterns.

At least five implications can be drawn from the data collected and observed behaviors of the experimentees, to wit:

1. No inhibitory measures should be taken to cause a decrement in its manifestation--a natural decrement occurs.
2. Implicit speech may be a frame of reference when we wish to validate written language patterns as being consonant with our own natural rhythm patterns of oral language.
3. A psychologically and pedogogically sound method to cause a decrement in the manifestation of implicit speech is to organize an optimal reading environment that is conducive to maturity in reading and language skills.
4. Augmenting a basal program with emphasis upon phonics, does not, per se, result in an undue manifestation of recorded implicit speech.
5. There is some evidence that when reading material is mechanically presented to readers, more recorded implicit speech is manifested.